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THE FLORA
OF THE
NILGIRI AND PULNEY HILL-TOPS
(ABOVE 6,500 FEET)

BEING THE
WILD AND COMMONER INTRODUCED FLOWERING
PLANTS

ROUND THE HILL-STATIONS OF
OOTACAMUND, KOTAGIRI AND
KODAIKANAL

With 286 full page illustrations and 4 maps

BY
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*Indian Educational Service,
Professor of Botany, Presidency College, Madras.*

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P R E F A C E .

THIS work began with an offer by Mr. W. S. Millard, Secretary of the Bombay National History Society, to publish illustrated notes on the Flora of the Nilgiris in the pages of his journal : and the Government of Madras on being approached promised a grant to defray the cost of coloured plates. But it was thought that the work would be more useful in book form, and that a large number of line-illustrations would be better than a few coloured ones : and finally Government ordered the printing and publishing of the work in its present form at the Government press.

A large number of the illustrations have been drawn by Lady Bourne [E.T.B.], to whose encouragement and untiring labour at these drawings the usefulness of the book is largely due. She not only drew over a hundred herself but she also placed at my disposal paintings done for her by various friends, from fifteen of which tracings have been made, while dissections of the flowers have been added in some cases. Chief among these other contributors has been Mrs. Harrison [M.F.H.], who has also drawn many specially for this work, the total number from her pen being nearly forty. Over eighty figures have been done by a young Indian artist, R. Natesan, whom I engaged to accompany me to the hills during my college vacations, and who made up for lack of botanical knowledge by remarkable skill and accuracy of drawing. Twenty-six drawings, chiefly of new species, were done by my wife [D.R.F.] in England. Four of these were of the difficult genus

Eriocaulon, in which the species are separated by characters which can be determined only with the help of a good lens, some of the flowers being under a twelfth of an inch. I doubt if drawings and dissections of this genus have ever before appeared in an illustrated Flora.

As explained above the work, as first projected, was to be of a semi-popular character, consisting of illustrations and short descriptive notes without aiming at the completeness or authority of a Flora. But before it was half-finished a sudden illness drove me to England, and I had there an opportunity of comparing my specimens with those at Kew. I then learnt that a large number of the names, to which we had become accustomed in South India, needed revision: partly because the new material, collected since the Flora of British India was written, has made critical determination more possible and partly because of the different conception of species now held; while several new species have since been discovered or described.

More than twenty have been re-named or had older names restored, mostly by being separated from North Indian species with which they had been united. Thus *Hypericum wightianum* Wall. had been united in the *Flora of British India* to *H. nepalense* Choisy, but is quite distinct in having a one-celled ovary with three parietal placentas, while the latter has three distinct cells. Again, *Jasminum bignoniaceum* Wall. had been reduced to *J. humile* Linn., a plant of uncertain origin, but obtained in the first instance from Spain or Italy, and different both in leaf and flower. An interesting find was that two species of *Dichrocephala*, *D. latifolia* DC. and *D. chrysanthemifolia* DC. are one and the same, a plant having been found with the characters of the former on its lower, and of the latter on its upper branches. But the chief discovery of this kind was in connection with

the common Indian plant, hitherto universally known as *Crotalaria rubiginosa Willd.* In the *F.B.I.* the species was given this name because, one must suppose, it appeared to agree with the description by Willdenow of a plant which was supposed to have been collected in the East Indies. And all subsequent local Floras of India have followed suit. As I had three nearly allied but yet distinct forms, I sent them to Berlin for comparison with Willdenow's type specimen. Dr. Harms, who very kindly himself examined the plants, found to his 'great surprise' that none of them was the same as Willdenow's plant, nor was it identical with either *C. wightiana* or *C. scabrella*, which were included in *C. rubiginosa* in the *F.B.I.*; but that Willdenow's type plant was identical with *C. sagittalis Linn.*, a North American species. The Indian plant, so long known as *C. rubiginosa Willd.*, must therefore be given another name, and I have restored that of *C. ovalifolia*, found on a specimen from Dindigul in the Wallich herbarium.

These instances will illustrate the necessity of comparing plants with original type specimens: and whenever this was possible it was done. Fortunately Kew has, in the collections of Wight, Wallich and others, most of the types of our species.

The entirely new species, described here in English for the first time, number ten; and of these four belong to the genus *Eriocaulon*, three to *Crotalaria* and one each to *Lasianthus*, *Anaphalis* and *Olea*. The usual Latin descriptions of these have already appeared in the *Kew Bulletin*. In addition there are another *Crotalaria*, another *Anaphalis* and a *Senecio*, which had been described a short time ago in the *Kew Bulletin* or the *Records of the Botanical Survey of India*. Of the foregoing, two species of *Crotalaria*, two of *Anaphalis*, a *Senecio*, an *Olea*, and four of *Eriocaulon* are figured

here for the first time ; as it is believed also, are another *Anaphalis* and two of *Eriocaulon*, and there are probably a few others. The inclusion of certain weeds may not perhaps appear to be necessary but I have had in mind Indian as well as English readers.

In arranging the families, genera and species, I have followed the *Flora of British India*, founded as that was on the *Genera Plantarum* of Bentham and Hooker : and, except where a difference is indicated, the species described is the same as that of the same name in the *F.B.I.* Synonyms are therefore not given, but for reference purposes the corresponding volume and page of that work are quoted immediately after the name, and any necessary explanation, of each species. The genera and species are not numbered consecutively as is usually done, but following the page reference are given the serial numbers of genus and species in the *F.B.I.*, or in the case of a new species the number (starred) which it would presumably have had in that work. Similarly with each genus is given the serial number of it and of the family as in the *F.B.I.*, the family in Arabic numerals, the genus in Roman, the species again in Arabic. This will enable any one not only to arrange a collection of dried material in the same order as in the *F.B.I.*, and at Kew, but will also allow of the insertion of other species collected elsewhere in their relative places. At the end of a description is given the number of the figure in the volume of illustrations, if there is one, in heavy type, and after that references to Wight's figures in his *Icones, Illustrations* or *Spicelegium neilgherrense*.

The figures given after the locality and distribution refer to the sheets in my collection from which the descriptions have been written and to the corresponding sheets in Sir Alfred Bourne's collection, now lodged at Kew.

In conclusion I have to thank first and foremost Lady Bourne, and the others also who have helped in the illustrations; Mr. and Mrs. Evershed of Kodaikanal, Miss Edwards of the Lawrence Memorial School, and Mr. Butcher, Curator of the Government Gardens on the Nilgiris, who have sent specimens or helped in other ways; Sir David Prain, K.C.M.G., C.I.E., Director of the Royal Botanic Gardens, Kew, Dr. Stapf, the Keeper, and other members of the Herbarium Staff especially Mr. W. G. Craib, for much assistance and advice; the Government of Madras for ordering the printing and publishing of the work; and finally Rao Bahadur K. Rangachariyar, Lecturing Botanist at Coimbatore, for reading the proofs.

The work has been throughout on the part of all concerned a labour of love.

P. F. F.

ERRATA.

Page 4.—For 'Meadow Rule' read 'Meadow-rue.'

Page 27, last line.—After 'lemon yellow' read 'or greenish.'

Page 80, line 23.—For "t. 62" read "t. 61".

Page 189, fourth line from bottom.—For 'var Hedyotis, etc.', read 'near Hedyotis, etc.'

Page 284, third line from bottom.—For 'C. elegans' read 'C. sphenanantha'.

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GLOSSARY OF THE COMMONER BOTANIC TERMS USED.

STEM, BRANCHES AND LEAVES.

<i>scape</i>	a leafless flowering stem or branch.
<i>root-stock</i>	...	...	the perennial underground portion which lives on when the leaves die down.
<i>node</i>	...	...	the part of the stem, usually swollen, where the leaf joins it.
<i>petiole</i>	...	...	the stalk of a leaf.
<i>axil</i>	...	...	the angle between a leaf or its stalk and the stem.
<i>base</i>	...	...	the part nearest the stem, whether of leaf or stalk.
<i>apex</i>	...	...	the point of a leaf.
<i>stipules</i>	...	...	small organs, usually in pairs, at the base of a leaf-stalk.
<i>nerves</i>	...	...	the main lateral veins of a leaf.

A LEAF OR OTHER PART IS DESCRIBED AS

<i>simple</i>	...	...	when the blade is single, however much it may be cut or lobed.
<i>compound</i>	...	...	when the leaf consists of several blades (leaflets) each with its own stalk.
<i>sessile</i>	...	...	when there is no stalk.
<i>pinnate</i>	...	...	when the leaflets are arranged to right and left on either side of the main stalk (t. 97).
<i>bi-pinnate</i>	...	...	when the leaf is doubly pinnate, consisting of several <i>pinnas</i> , each with leaflets to right and left (t. 94).
<i>palmate</i>	..	...	when the leaflets are attached together at the end of the main stalk (t. 270).
<i>palmati-fid,</i> <i>pinnati-fid.</i>			when cut or lobed in palmate or pinnate fashion (t. 35).
<i>palmati-sect,</i> <i>pinnati-sect.</i>			when more deeply cut, almost into separate leaflets.
<i>cordate</i>	...	...	when the shape of a conventional heart, attached at the broad end (t. 19).
<i>ob-cordate</i>	...	...	similar but attached at the other end.
<i>ovate</i>	...	...	when egg-shaped in general outline and attached by the broader end.
<i>ob-ovate</i>	...	...	similar, but attached at the narrower end.
<i>lanceolate</i>	...	...	when narrower than ovate, like the head of a lance.
<i>oblancoolate</i>	...	...	similar but attached at the narrower end.
<i>linear</i>	...	...	when slender or very narrow.

<i>cuneate</i> ...	...	when wedge-shaped.
<i>obtuse</i> ...	...	with blunt tip.
<i>acute</i> ...	...	with sharp point.
<i>acuminate</i> ...	...	with long drawn out point (leaflets in t. 67).
<i>micronate</i> ...	...	the midrib prolonged as a tiny point.
<i>emarginate or notched.</i>		when indented at the point.
<i>entire</i> ..	...	if the margin is perfectly even.
<i>serrate</i> ...	...	if there are teeth pointing forward (t. 212).
<i>crenate</i> ...	...	if there are rounded teeth.
<i>lobed</i> ...	...	if the margin is much waved.
<i>pectinate</i> ...	...	deeply jagged, like a comb.
<i>coriaceous</i> ...	...	when thick and firm or leathery.
<i>scarious</i> ...	...	when thin and papery.
<i>glabrous</i> ...	...	when the surface is smooth without hairs.
<i>scabrid</i> ...	...	when the surface is roughened by low hard hairs.
<i>tomentose</i> ...	...	when covered with a close mat of short hairs.
<i>pubescent</i> ...	...	when thinly covered with soft short hairs.

THE FLOWERING PART OR INFLORESCENCE.

<i>raceme</i> ...	...	an arrangement of flowers one above another, on short stalks: the stem continuing to grow and produce buds at the top (t. 12).
<i>spike</i> ...	...	similar, but the flowers not stalked (t. 251).
<i>cyme</i> ...	...	typically of three flowers, the middle one opening first: the main stem ending in a flower, while a second and third flower are produced just below in the axils of bracts (t. 1).
<i>scorpio'id cyme</i> ...	...	a double row of flowers along a stalk which is curled up backwards at first (as in <i>Heliotrope</i> or t. 194).
<i>corymb</i> ...	...	a flat-topped bunch. Strictly speaking a flattened raceme but also of cymose bunches (t. 165).
<i>panicle</i> ...	...	a branched raceme, or mixture of raceme and cyme (tt. 1, 63).
<i>umbel</i> ...	...	the flowers on stalks arising together at one spot (tt. 20, 44); usually compound—an umbel of umbels (t. 129).
<i>fascicle</i> ...	...	a close cluster, with or without stalks (t. 61).
<i>head</i> ...	...	a close mass of flowers with bracts below,
<i>involucre</i> ...	...	cup of bracts below a head (t. 148).
<i>bract</i> ...	...	small leaf-like or very small organs. When flowers are not solitary the stalks nearly always arise in the axils of bracts.
<i>bracteoles</i> ...	...	bracts on the flower-stalk.
<i>pedicel</i> ...	...	the stalk of a single flower.
<i>peduncle</i> ...	...	the common stalk of several flowers.

THE FLOWER AND ITS PARTS.

THE ESSENTIAL ORGANS.

- stamen* ... a stalk, or *filament*, carrying an *anther*, which contains grains of *pollen*. The latter is the male medium which fertilises the egg-cell in the young seeds.
- carpel* or *ovary* of several *carpels*. a closed case of one or more compartments or *cells*, containing the immature seeds, *ovules*, and surmounted by a stalk, *style*, bearing a sticky surface *stigma*, on which the pollen grains are caught.

OTHER PARTS.

- corolla* ... the petals considered together, and whether united or not.
- sepals* ... the outer, usually, green envelope.
- calyx* ... the cup formed by the union of sepals or the expansion of the end of the flower-stalk.
- perianth* ... the envelope of a flower, calyx or corolla or both, considered collectively.
- epicalyx* ... bracts occasionally below and outside the calyx.
- staminodes* ... sterile stamens, usually flattened, often petal-like.
- disc* ... a honey-secreting part at the base of the flower. May be flat, or cup-shaped (t. 69) or in two or more parts.
- versatile anther* ... lightly attached so that it easily swings.
- unisexual* ... a flower with stamens but no ovary, or ovary but no stamens.
- monocious* ... the flowers of either sex, both on the same plant.
- diocious* ... plants unisexual, with male or female flowers only.

PETALS AND SEPALS ARE DESCRIBED AS

- valvate* ... when in bud the edges touch but do not overlap.
- convolute* ... when in bud each overlaps the one next it, to the right or to the left.
- imbricate* ... when some overlap by both edges, some by one only, others are overlapped by both edges.

OVARY, FRUIT, SEED, ETC.

- placenta* ... the slightly raised ridge, inside the carpel or ovary, along which the ovules are borne.
- axile placentation*. the placentas are at the inner angles of the many-chambered ovary.
- parietal placentation*. the placentas run down the outer wall of the (nearly always) single-chambered, or *one-celled*, ovary.
- capsule* ... a dry fruit, which opens in various ways.
- loculicidal* ... the opening of a capsule down the middle of each *cell*,

<i>achene</i>	...	...	a dry seed-like fruit, containing one seed. Not opening. (Sunflower.)
<i>drupe</i>	...	...	a juicy fruit, the seed enclosed inside a hollow stone.
<i>berry</i>	...	...	a juicy fruit with one or more seeds, not enclosed in a stone.
<i>pyrene</i>	...	...	the hard or tough partial stone inside some fruits.
<i>micropyle</i>	...	...	a small hole leading through the coating of a seed.
<i>raphe</i>	...	...	the part along which the stalk of a seed is attached to it.
<i>hilum</i>	...	...	the scar left on a seed by separation from the stalk.
<i>endosperm</i>	...	...	food material contained in some seeds round the embryo.
<i>cotyledons</i>	..	...	the first leaf or pair of smooth leaves of the seedling plant; and formed in the seed.

INTRODUCTION.

THE first account of the Flora of the Pulney Hills was, I believe, published by Robert Wight in the Journal of the Madras Literary and Scientific Society in 1837. It is doubtful, however, whether he collected from the plateau, for the highest levels reached seem to have been Shembaganur and Perumal. At about the same time he published a volume of figures, with short descriptions, of the commoner Nilgiri plants under the name *Spicelegium neilgherrense*, most if not all of which also appeared in his *Illustrations of the Flora of South India* or his *Icones*. These are now all very scarce and only available for reference in certain libraries and government offices. Twenty-one years later Colonel Beddome published, again in the Journal of the Madras Literary and Scientific Society, a list of 700 species collected on the Pulneys; and he also wrote an account of the Flora of the Nilgiris for the Nilgiri District Manual, in which he gives separate lists of the commoner plants composing the shola, and open grass land vegetation of the plateau. Since then the only accounts which have appeared, as far as I know, have been short notes, such as Mrs. Mackay's charmingly written *Wild Flowers of Kodaikanal*, and in local guides.

The area dealt with in this book consists of the two plateaus, especially of the parts from Kotagiri to Ootacamund and Pykara, and near Kodaikanal; which range from 6,500 to 8,500 feet above sea level. The lower limit of 6,500 feet has been chosen because at about this level the vegetation changes quite rapidly from the rich tropical and subtropical arboraceous flora of the steep slopes to one of a more temperate and also more herbaceous character. Thus we find here species nearly

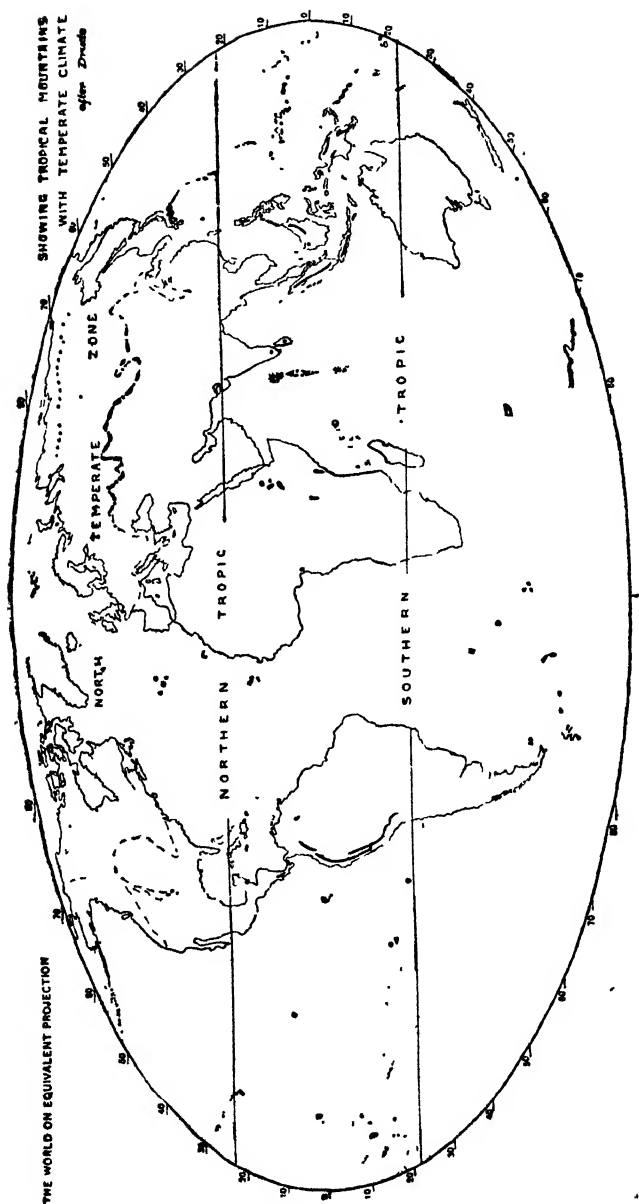
allied and often in general appearance very similar, to many common English plants, such as Traveller's Joy or Old Man's Beard, Anemone, Buttercup, Barberry, Bittercress, Charlock, Violet, Milkwort, Campion, Chickweed, Sandwort, St. John's-wort, Mallow, Flax, Herb Robert, Spindlewood, Buckthorn, Bramble, Strawberry, Dog Rose, Silver-leaf, Ladysmantle, Grass of Parnassus, Sundew, Pennywort, Pimpernel, Cow Parsnip, Guelder-rose, Honeysuckle, Woodruff, Goose-grass, Valerian, Teasel, Fleabane, Ragwort, Hawksbeard, Sowthistle, Hairbell, Bilberry, Creeping Jenny, Yellow Loosestrife, Privet, Gentian, Lousewort, Bladderwort, Vervein, Catmint, Skullcap, Wood Germander, Knotgrass, Sorrel, Mistletoe, Spurge, Nettle, Willow, Butterfly and Marsh Orchids, and Sedges of various kinds. And in addition there are a few quite the same, such as Self-heal, Pimpernel, Wood Sanicle and Common Rush, truly wild, besides introduced weeds. On the other hand Coonoor which lies just below this level has not only so many Australian and American introduced plants as to make it more suitably dealt with in a separate volume, but also many Indian species which have crept up from the lower slopes and even the plains, under the shelter of the warm moist valleys.

While no claim is made that every species of flowering plant which occurs above this level has been noted, it is believed that all those ordinarily met with, except the introduced garden plants and weeds (but some of those also), will be found described. The descriptions are founded in nearly every case on plants collected by the author and many were written in the field or from fresh specimens; but a few are from specimens in the collection made by Sir Alfred and Lady Bourne, which has since been sent to Kew; and the *Flora of British India* has been constantly referred to and sometimes drawn upon, especially in regard to the geographical distribution of a species.

The total number of species described is nearly 500, of which 430 are considered indigenous. Of these 44, or

rather more than 10 per cent., are known only from the Nilgiris ; and 29, or 6·6 per cent., only from the Pulneys. One hundred and twenty, or 28 per cent., are not known outside Southern India ; and another 72, or 17 per cent., only in Ceylon. So that as much as 45 per cent., or nearly half, the truly wild and indigenous species of the flowering plants of these plateaus are confined to the mountains of South India and Ceylon. Another 17 per cent. occur on the Khasi hills, 1,500 miles away ; and about 12 per cent. on the temperate parts of the Himalayas : but practically none at all in all the intervening country, even along the Western Ghats. China and Japan appear to have 40 of our species.

There are 264 genera represented, exclusive of introduced plants, and of these about one-quarter might be described as belonging properly to the temperate regions (and almost exclusively the north-temperate), the remainder to the warmer parts of the world, including tropical mountains. The temperate genera consist almost entirely of the smaller herbaceous plants, exclusive of grasses ; on the other hand practically all the trees, shrubs and grasses belong to tropical or subtropical genera. Thus though at first sight the flora appears a temperate one, for the reason that it is the brightly flowering herbs that first attract one's attention, it would more accurately be described as typical of a high mountain in the tropics. On the accompanying map are shown other mountain-tops with similar floras. It will be noticed how widely separated they are : and since the intervening lands cannot have been crossed in recent times by such species, it is usually supposed that we have on these mountain-tops relics of a vegetation which grew on the plains in the far distant past, when, as we have reason to believe from other evidence, the climate of the tropics was not so hot. The alternative explanation that seeds have been carried by birds across these long stretches, though possibly true to a certain extent, does not seem to afford a complete explanation.



KEY TO THE FAMILIES AND CERTAIN ABNORMAL GENERA.

- 1 { Flowers in compact heads backed by an involucre of green bracts 2
- 1 { Flowers solitary or variously arranged, if in a head with no involucre of separable bracts below 3
- Heads white or grey on leafless stalks rising from a group of narrow radical leaves. Flowers minute. (Hatpin flower) *p.* 427. ERIOCAULON.
- Anthers united round the style. No calyx. (Sunflower, etc.) *p.* 205. COMPOSITÆ.
- 2 { Anthers free attached at various heights to the inside of the slender perianth. Heads very densely woody. *p.* 350. LASIOSIPHON.
- Anthers free on slender filaments. Leaves opposite *p.* 204. DIPSACUS.
- Flowers small in spikelets. (Grasses and Sedges) 70
- 3 { Flowers minute, without sepals or petals 60
- 3 { A perianth round each flower 4
- 4 { Perianth inconspicuous, of one whorl not distinguishable as petals and sepals, greenish or brownish 54
- 4 { Perianth conspicuous, usually of white or coloured petals and green sepals 5
- Sepals and petals four or five; petals quite free at the base 7
- Sepals and petals four or five; petals united at least at the base 34
- 5 { Sepals and petals three, all alike or sepals less coloured, or one petal or sepal larger or spurred 61
- 5 { Sepals five, petals three 6
- 6 { Flowers minute in large panicles: fruit $\frac{1}{4}$ inch, drupe. (Spiræa tree) *p.* 91. MELIOSMA.
- 6 { Lowest petal boat-shaped, fringed *p.* 26. POLYGALA.
- 7 { Ovary superior, i.e., inserted above the base of the inferior petals and stamens 8
- 7 { Ovary inferior, usually sunk in the end of the flower-stalk 28

xx KEY TO FAMILIES AND ABNORMAL GENERA.

Polypetals with superior ovary.

- | | | | |
|----|---|--|-------------------------------|
| 8 | { | Style single unbranched, on an ovary of one or more cells | 9 |
| | | Styles three to five or branched, ovary of one or more cells | 19 |
| 9 | { | Ovary and fruit one cell | 10 |
| | | Ovary of two to five cells | 15 |
| 10 | { | Stamens five only : flowers regular or nearly so . . . | 11 |
| | | Stamens seven to ten, free or united : seeds attached to one edge only of the pod | 14 |
| | | Stamens numerous : flowers in small heads | <i>p.</i> 127. ACACIA. |
| 11 | { | Seed one only. Trees | 12 |
| | | Seeds several | 13 |
| 12 | { | Flowers small, evil-smelling, in cymose corymbs : leaves simple, broad, soft. Trees | <i>p.</i> 74. MAPPIA. |
| | | Flowers in tall panicles : leaves simple hard, or pinnate. "Spiræa-tree" | <i>p.</i> 91. MELIOSMA. |
| 13 | { | Trees with leave simple : seeds in sticky pulp : fruit two-valved | <i>p.</i> 23. PITTOSPORUM. |
| | | Small herb : fruit dry, three-valved : seeds many on the valves | <i>p.</i> 20. VIOLA. |
| 14 | { | Petals very unequal, the lowest keel-shaped enclosing the ten stamens | <i>p.</i> 94. PAPILIONACEÆ. |
| | | Petals nearly equal : anthers often only seven | <i>p.</i> 124. CÆSALPINIÆ. |
| 15 | { | Stamens four or five, as many as the petals | 16 |
| | | Petals four, clawed : stamens six : ovary of two cells with seeds on the margin of the partition. <i>p.</i> 15. CRUCIFERÆ. | |
| | | Stamens many : leaves alternate. Trees | 18 |
| 16 | { | Stamens opposite the petals. Climber with leaf-opposed tendrils and flower bunches. | <i>p.</i> 86. VITIS. |
| | | Stamens opposite the sepals. Trees or climbers without tendrils | 17 |
| | | Leaves of three leaflets with many translucent dots. Trees or prickly climbers | <i>p.</i> 71. RUTACEÆ. |
| 17 | { | Leaves alternate, glossy, simple : fruit fleshy. <i>p.</i> 75. ILEX. | |
| | | Fruit capsule : seeds with coloured aril : leaves alternate or opposite | <i>p.</i> 77. CELASTRACEÆ. |
| 18 | { | Anthers long-pointed : fruit a drupe | <i>p.</i> 47. TILIACEÆ. |
| | | Anthers round, fruit opening | <i>p.</i> 39. TERNSTRÆMIACEÆ. |

- 19 { Ovary one-celled 20
 { Ovary of several cells or carpels 22
 Seed solitary: stipules tubular encircling the stem at each
 node. Leaves alternate . . . *p.* 338. POLYGONACEÆ.
- 20 { Seeds several on a central placenta. Herbs with opposite
 leaves and swollen nodes . . . *p.* 29. CARYOPHYLLACEÆ.
 { Seeds several, on the walls of the ovary 21
 Climber with axillary tendrils: stamens and style raised on
 a central column *p.* 163. PASSIFLORA.
- 21 { Slender trailing herb with opposite gland-dotted leaves:
 flower yellow: stamens many . . . *p.* 36. HYPERICUM.
 Herb with very sticky often red leaves: flower white:
 stamens five. In damp ground . . . *p.* 145. DROSERÆ.
 Stamens five only, opposite the petals 23
 Stamens five, outside a crenulate disc: fruit three-celled:
 leaves pinnate. Tree *p.* 90. TURPINIA.
- 22 { Stamens ten or five and five staminodes: petals twisted in
 bud. Fruit five-celled 24
 Stamens five, opposite the sepals. Leaves covered with
 sticky hairs *p.* 145. DROSERÆ.
 Stamens many united or free 25
- 23 { Climbers with tendrils opposite the leaves . . . *p.* 86. VITIS.
 { Trees or shrubs: fruit with one or more stones
p. 82. RHAMNACEÆ.
 Fruit splitting into five, long-tailed, one-seeded carpels. .
p. 51. GERANIACEÆ.
- 24 { Fruit splitting into five two-seeded or ten one-seeded
 parts: leaves entire. *p.* 50. LINUM.
 Fruit opening along five lines, the carpels not separating
 from each other *p.* 54. OXALIDACEÆ.
- 25 { Carpels quite distinct. 26
 { Ovary of three to ten cells. 27
 Trees: branches ringed at each leaf: flowers 2 to 3 inches
 across: fruiting carpels $\frac{1}{2}$ inch a spike of 3 to 5 inches.
p. 9. MAGNOLIACEÆ.
- 26 { Herbs: no epicalyx below the sepals
p. 1. RANUNCULACEÆ.
 Prickly shrubs or if herbs then with five bracteoles imme-
 diately below the sepals. *p.* 129. ROSACEÆ.
- 27 { Trees: leaves finely serrate: flowers $\frac{1}{6}$ inch, in small
 subsessile bunches. *p.* 41. EURYA.
 { Herbs: leaves divided or lobed: flowers $\frac{1}{2}$ to 2 inches:
 anthers numerous kidney-shaped. . . *p.* 43. MALVACEÆ.

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Polypetals with inferior ovary.

- 28 { Stamens five or six, as many as the petals. 29
 { Stamens four to ten, twice the petals 31
 { Stamens numerous 33
- 29 { Herbs with small opposite leaves and pink flowers in leafy
 spikes. In damp places *p.* 159. AMMANNIA.
 { Herb with alternate heart-shaped leaves and solitary white
 flowers. In damp places *p.* 141. PARNASSIA.
 { Strongly smelling plants with small umbelled flowers . 30
- 30 { Shrubs or trees : leaves large palmate. *p.* 177. ARALIACEÆ.
 { Herbs : leaves entire or much divided : fruit separating
 into two halves. *p.* 167. UMBELLIFERÆ.
- 31 { Parts of flower in twos or fours. Herbs.
 { Petals four to five ; anthers eight to ten, large or blue, horned
 at the base or filament bent . *p.* 154. MELASTOMACEÆ.
- 32 { Flowers unisexual, small. In marshes. *p.* 147. SERPICULA.
 { Land plants ; flowers often large . *p.* 160. ONAGRACEÆ.
- 33 { Leaves entire, scented, opposite except in *Eucalyptus* :
 stamens curled inwards in bud . *p.* 147. MYRTACEÆ.
 { Leaves alternate toothed, simple or not. *p.* 129. ROSACEÆ.
- 34 { Ovary or carpels superior 40
 { Ovary inferior : fruit crowned by the dried calyx or its
 scar 35

Monopetals with inferior ovary.

- 35 { Shrubs parasitic on other trees : seed very sticky, anthers
 five, slender *p.* 352. LORANTHACEÆ.
 { Herbs, shrubs or trees rooting in the ground. 35
- 36 { Leaves alternate 37
 { Leaves opposite. . (See also 2) 39
- 37 { Fruit one-seeded : trees with many stamens : leaves
 usually toothed. *p.* 271. SYMPLOCOS.
 { Fruit with many seeds 38
- 38 { Stigma unbranched : stamens ten, opening by holes, horned :
 tree or shrub *p.* 257. VACCINIACEÆ.
 { Stigmas three, climber, leaves angular rough : stamens
 three, S-shaped. *p.* 165. CUCURBITACEÆ.
 { Herbs, small or tall : stigmas two or three : flowers bell-
 shaped or two-lipped. *p.* 253. CAMPANULACEÆ.
 { Stamens three : fruit with feathery hairs. Herbs.
p. 202. VALERIANACEÆ.
- 39 { Stamens four or five : leaf-stalks at least when young con-
 nected by united stipules. *p.* 185. RUBIACEÆ.
 { Stamens five : leaves of a pair connected by a line only,
 no stipules. *p.* 180. CAPRIFOLIACEÆ.

Monopetals with superior ovary.

- 40 { Stamens united round and to the stigma: carpels and styles inside two, distinct; fruit of two follicles: leaves opposite *p.* 281. ASCLEPIADACEÆ.
 { Stamens distinct 41
- 41 { Stamens five equal in number to the corolla lobes . . . 43
 { Stamens eight or ten double the corolla lobes. . . . 42
 { Stamens four or two usually fewer than the corolla lobes. 46
- 42 { Stamens eight: succulent herbs with thick leaves, and yellow, four petalled flowers . . . *p.* 144. KALANCHOE.
 { Stamens ten: anthers opening by terminal pores leaves hard *p.* 259. ERICACEÆ.
- 43 { Stamens on the corolla, opposite its lobes: ovary one-celled 44
 { Stamens between the corolla lobes. 46
- 44 { Herbs: flowers yellow or pink: seeds many on central placentum. *p.* 262. PRIMULACEÆ.
 { Trees or shrubs: seed one only 45
- 45 { Sepals $\frac{1}{2}$ inch, brown tomentose on the outside: petals white: fruit $\frac{3}{4}$ inch yellow . . . *p.* 269. SIDEROXYLON.
 { Flowers small, pink: leaves gland-dotted: fruit small . . . *p.* 266. MYRSINACEÆ.
- 46 { Leaves alternate at least the lower, or radical . . . 47
 { All leaves opposite 48
- 47 { Leaves radical: flowers in a spike terminating a leafless stem: capsule opening across. . . . *p.* 336. PLANTAGO.
 { Twining plants: corolla folded inwards and twisted in bud. *p.* 293. CONVULVULACEÆ.
 { Erect rough herb: flowers in a double row, on one side of a curled spike. *p.* 292. BORAGINACEÆ.
 { Upper leaves often in unequal pairs: ovary not divided to the top: seeds flat. *p.* 295. SOLANACEÆ.
 { Submerged or marsh plant: flowers small unisexual . . . *p.* 147. SERPICULA.
- 48 { Climber: fruit scarlet *p.* 287. LOGANIACEÆ.
 { Erect herbs: leaves three to seven-nerved: capsule incompletely two-celled *p.* 288. GENTIANACEÆ.
- 49 { Leaves opposite 50
 { Leaves radical: or upper at least alternate.
- 50 { Corolla regular, twisted or valvate in bud, stamens two: fruit fleshy *p.* 274. OLEACEÆ.
 { Corolla-lobes imbricate in bud. 51

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- Fruit of four (dry) nutlets : flowers usually in dense whorls : scented herbs *p.* 321. LABIATÆ.
- 51 { Fruit fleshy or of two parts : flowers in spikes or open panicles. *p.* 318. VERBENACEÆ.
- Fruit a capsule with few or many seeds 52
- 52 { Nodes swollen : bracts in spike conspicuous : capsule oblong : seeds on springy-stalks . *p.* 310. ACANTHACEÆ.
- Capsule long and slender : leaves thick. *p.* 308. ÆSCHYNANTHUS.
- Capsule short. 53
- 53 { Small marsh plants with submerged, finely divided leaves, often bearing bladders : flowers few with sharp spur. *p.* 306. UTRICULARIA.
- Capsule globose or oblong : seeds not on hard stalks : bracts not conspicuous . . *p.* 298. SCROPHULARIACEÆ.

Petal-less flowers.

(The following are a mixed lot, containing families with only one perianth whorl and petal-less genera and species from families which have normally complete flowers. For flowers with conspicuous coloured sepals but no petals see Nos. 2 and 8.)

- { ' Flower ' apparently consisting of a four or five-lobed cup enclosing numerous stamens (male flowers), and a solitary stalked, three-lobed ovary (female flower). Herbs with milky juice *p.* 360. EUPHORBIA.
- 54 { Flowers unisexual in a short thick spike with bracts below : male perianth red, lobed, $\frac{1}{2}$ inch ; stamens united ; female without perianth. Thick warty leafless plant parasitic on the roots of trees . . *p.* 358. BALANOPHORA.
- Stamens one to five, as many as the sepals or fewer : fruit one-seeded 55
- Stamens five to twelve 58
- Stamens numerous 59
- 55 { Ovary inferior 56
- Ovary superior : stamens opposite the sepals. 57
- Trailing plant with long stalked, round-lobed, leaves folded fanwise *p.* 137. ALCHEMILLA.
- 56 Shrub often straggling or spiny : all parts covered with flat glistening scales *p.* 351. ELÆAGNUS.
- Shrub or herb : no glistening scales. *p.* 357. SANTALACEÆ.

- 57 { Tree : leaves opposite : ovary two to three-celled
 p. 79. MICROTROPIS.
 Herb, shrub or tree : ovary one-celled. *p.* 366. URTICACEÆ.
 Stamens twelve, fruit 1 inch, transversely two-lobed : leaves
 entire. A tree *p.* 130. PYGEUM.
 Stamens ten, attached at various heights inside the tubular
 perianth. A small tree (see 2). . *p.* 350. THYMELEACEÆ.
 58 { Tree : stamens united at the base : seeds many with
 coloured aril : flowers fascicled . *p.* 162. SAMYDACEÆ.
 Herb or shrub : stipules or tubes encircling the stem at
 each node : seed solitary erect . *p.* 338. POLYGONACEÆ.
 Shrub : flowers often unisexual : anthers large : fruit
 three-winged capsule *p.* 88. DODONÆA.
 Herb with much divided leaves : carpels many separate.
 p. 4. THALICTRUM.
 Trees : leaves entire : flower unisexual : fruit a drupe or
 dry *p.* 359. EUPHORBIACEÆ.
 59 { Tree : female flower surrounded at the base by imbricating
 scales, which in fruit form a cup holding the nut (acorn)
 sak *p.* 377. QUERCUS.
 Shrub : carpels in fruit fleshy, each with one seed
 p. 337. PHYTOLACCA.
 Flowers in a thick spike enclosed in a spathe : leaves large,
 radical *p.* 424. ARACEÆ.
 Flowers in slender spikes : climbers with alternate three-
 nerved leaves or epiphytes with leaves in fours
 p. 342. PIPERACEÆ.
 60 { Flower consisting of two or more stamens and an ovary
 only in the axil of a small bract, arranged in spikes.
 Trees with alternate, stipulate, toothed leaves (Willow)
 p. 377. SALIX.
 Flowers aggregated in flat or hollow, fleshy involucre . .
 p. 366. URTICACEÆ.

Sepals three, petals three, stamens usually three or six.

- Stamens and style united into one column : one petal
 (usually the front one) larger often spurred or saccate :
 seeds minute. Perennial herbs, on the ground or on
 trees *p.* 379. ORCHIDACEÆ.
 61 { Anthers five, connected round the stigma, but free of it :
 hind petal hooded, two front petals bifid : front sepal
 spurred or saccate. Herbs, all on the ground
 p. 59. BALSAMINEÆ.
 { Other herbs, shrubs and trees 62

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- Anther one only, large; style passing between its lobes :
 ovary inferior *p.* 407. ZINGIBERACEÆ.
- 62 Slender twining plant with ovate peltate leaves: fruits
 crescent-shaped *p.* 11. MENISPERMACEÆ.
- Stamens three, six, nine or twelve. Trees, shrubs and
 herbs 63
- 63 { Anthers opening by lateral holes, covered by flaps: stamens
 six to twelve 64
 Anthers opening by slits: stamens three to six. 65
- 64 { Flowers in open racemes: fruit juicy: all stamens
 fertile *p.* 13. BERBERIDACEÆ.
 Flowers clustered inside an involucre of bracts: fruit
 hard: some stamens sterile *p.* 345. LAURINEÆ.
- 65 { Flowers in cymes or solitary: fruit $\frac{1}{2}$ inch drupe or
 splitting into one-seeded parts: leaves pinnately
 veined *p.* 359. EUPHORBIACEÆ.
 Fruit a capsule, herbs: leaves absent or veined from the
 base 66

Monocotyledons with three to six stamens.

- 66 { Ovary inferior.
 Ovary superior 67
 Stem and branches green, needle-like and thorny:
 flowers white: fruit $\frac{1}{4}$ inch berry . *p.* 414. ASPARAGUS.
 Green stem and narrow roundish leaves almost indistin-
 guishable: flowers scarious: fruit dry
- 67 { *p.* 423. JUNCACEÆ.
 Flowers in a small cone on a leafless stem: basal leaves
 narrow, ribbed: petals three, bright yellow . *p.* 417. XYRIS.
 Leafy herbs 68
 Petals three, connected at the base, distinct from the
 sepals: usually blue *p.* 418. COMMELINACEÆ.
- 68 { Petals and sepals usually both white, never blue
p. 413. LILIACEÆ.
 Small often leafless marsh plant; perianth surrounding the
 ovary with three twisted wings . . . *p.* 379. BURMANNIA.
- 69 Leaves narrow: flowers solitary or umbelled, in the axil of
 a spathe on a leafless stem . . . *p.* 410. AMARYLLIDACEÆ.
 Leaves narrow: flowers racemed. . . *p.* 410. OPHIOPOGON.
 Stems triangular: sheathing base of leaf not split . . .
p. 433. CYPERACEÆ.
- 70 { Stem roundish: sheath split, a flap or line of hairs at
 junction between sheath and blade . *p.* 444. GRAMINEÆ.

THE FLORA OF THE NILGIRI AND PULNEY HILL-TOPS.

RANUNCULACEÆ.

THE predominant feature of the flower of this family is the spiral arrangement on a convex centre (*torus*) of the numerous stamens and carpels, the latter being quite free of each other even in fruit. The flowers may be solitary at the ends of the branches, or in cymes, or occasionally in racemes; and are usually showy. Often there is no marked difference between the sepals and petals, the former being coloured; and in some genera there are no petals, the sepals supplying all the colour, as in *Clematis* and *Anemone*. The plants are mostly perennial herbs with stout rootstocks and alternate, mostly radical, leaves which are often characterized by a sheathing base to the stalk and irregularly parallel or palmate venation; but *Clematis* is an exception. Among garden plants are various species of *Anemone* (including the *Hepaticas*), *Clematis*, Monk's Hood, Larkspur, Pœony, and Columbine.

The family consists of 70 genera and about 700 species, nearly all in the northern temperate regions, or (a few only) on high mountains in the tropics and south temperate. One species, however, *Naravelia zeylanica*, DC, allied to the *Clematis*, grows in Madras. With the exception of these two genera there are only three rare species between the southern highlands of the Western Ghats and the Himalayas: even on the hills of Mysore, Bombay, or the United Provinces.

- Climbing plants with opposite compound leaves and the achenes (carpels in fruit) tailed. No petals. Sepals four, yellow or white. . . . (Travellers' Joy). CLEMATIS.
 Ground herbs. Stem with two or three leafy bracts a few inches below the flowers. Achenes (carpels in fruit) longer than broad and beaked. No petals. ANEMONE.
 Ground herbs. No involucre of leaves below the flower. Achenes not much longer than broad. Sepals and petals. (Buttercup) RANUNCULUS.
 Tall well-branched herbs with smooth slender stem and leaves like Maiden Hair. No petals. Sepals soon falling and leaving only a fluffy ball of white stamens. . . . (Meadow Rue). THALICTRUM.

CLEMATIS.

F.B.I. I I.

Travellers' Joy.

Thin stemmed woody plants climbing by leaf-stalks coiling round the support. Leaves opposite, pinnately or ternately compound. Flowers axillary or terminal, solitary or paniced, without bracts and without petals, but with sepals often highly coloured and large. Carpels many, one-ovuled, ripening into tailed achenes (containing only one seed and not opening).

Species about 180, almost all over the temperate and, less commonly, tropical regions of the world.

Named after the Greek, from the word KLEEMA a climber, but the Greek name KLEEMATIS was given to other climbers as well

In Europe the commonest wild species is *C. vitalba* Linn; *Eng* Travellers' Joy, Old Man's Beard, or Virgin's Bower; *Ger.* Waldrebe; *Fr.* Consolation, Vigne blanche, Berceau de la tres-sainte Vierge; which flowers in the autumn.

***Clematis wightiana* Wallich Cat. 4674!**; *F.B.I.* i 5, I 15; Travellers' Joy: a woody climber with opposite pinnate leaves compounded of three to five softly hairy leaflets, and axillary panicles of cream-coloured flowers.

Stem slender, ribbed, covered with short appressed hairs. Leaf-stalks 2 to 4 inches, without stipules. Leaflets ovate, lobed or cut into rounded teeth with short points hairy on both sides, densely so on the lower; veins

conspicuously raised on the lower side, impressed on the upper. Panicles of flowers up to 12 inches, or more; buds globular of strongly veined sepals; flowers when fully open 2 inches across. Sepals four, yellow or cream-coloured above, pale or yellowish green on the back. No petals. Stamens very numerous, hairy below the middle, widening at the top to the anthers which open laterally. Carpels very silky with styles of about $\frac{5}{8}$ inch forming a close fagot in the centre, becoming in fruit achenes with feathery style 1 inch or more long, when quite ripe. t. 1. Wight Sp. Nilg. t. 30, Ic. t. 955.

On thickets and small trees on the edges of sholas. Nilgiris near Ootacamund, flowering November–February; Avalanche. Pulneys below Kodaikanal. *Fyson* 674, 2011. *Bourne* 1553.

Gen. Dist. Higher levels of the Western Ghats, Mableswhar (Dalzell!). Nearest ally appears to be *C. sinensis* of Ceylon.

***Clematis munroana* Wight; F.B.I. i 3, under *C. smilacifolia* Wall.; I 6;** a climber with three-glabrous, five to seven-nerved, entire leaflets to the leaf; and large white flowers in stalked cymes of three: occurs at Coonoor and near Shembaganur and may possibly be found occasionally at higher levels. *Bourne* 400.

C. smilacifolia Wall., a Himalayan species with which this is united in F.B.I., has dark purple almost black flowers, but agrees in having the backs of the sepals brown-tomentose and in other respects

ANEMONE.

F.B.I. I III.

Perennial herbs with an involucre of two or three leafy bracts a little below the flowers; white or coloured sepals but no petals; and numerous one-ovuled carpels ripening into achenes with hardened, hook-like style.

Species about 90 in temperate regions and mountains of the tropics; a few only in South America, South Africa, and Australia.

Named from the Greek, ANEMOS, wind, because most European species grow in windy places or flower at a windy time of the year, spring.

Anemone rivularis *Hamilton*; *F.B.I.* i 9, III 10, common wild *Anemone*: a perennial herb with well-branched stem; leaves divided into three, and those of the flowering stems into narrow-toothed segments; and large white flowers.

Rootstock stout, vertical, clothed at the top by the fibrous remains of the leaf-bases. Radical leaf-stalk 2 to 12 inches long: blades three-partite, the segments again cut deeply into three wedge-shaped parts, and these again deeply cut or toothed; very softly hairy on both sides; the lowest sometimes several inches across. Flowers terminating stalks of 5 to 8 inches in loose few-flowered cymes: lower bracts deeply, pinnately, cut into three segments which are again deeply lobed and serrate; upper bracts simpler but usually three-lobed. Flowers 1 to 1½ inches white with purplish tinge on the back. Sepals five or six, obovate oblong. No petals. Stamens numerous. Carpels with short-hooked style, in fruit ¼ to ½ inch, each with one seed. t. 2. Wight Sp. Nilg. t. 4, Ic. t. 936. (*A. wightiana*.)

Everywhere on the upper levels, luxuriant in damp places, dwarfed in dry. Nilgiris all over the plateau. Pulneys in and above Kodaikanal. *Fyson* 280, 1339, 1425. *Bourne* 13.

Gen. Dist. Higher mountains of India 5,000 to 13,000 feet on the Sikkim Himalayas and 16,000 at Samlung (J.D H. leaves nearly glabrous!). In North Indian specimens the segments of the bracts are often broader, and near Simla is a form with umbelled flowers!

THALICTRUM.

F.B.I. I IV.

Meadow Rule, etc.

Herbs with perennial rootstock, ternately multi-compound leaves, and racemes or panicles of yellow, purple, or white flowers, usually small but with numerous conspicuous stamens, numerous one-ovuled carpels ripening into ribbed achenes, imbricate sepals, and no petals.

Differs from *Anemone* in having no involucre of leaves whorled just below the flowers.

Species about 76 almost all over the world outside tropical climates, more especially in Europe, Asia and America. In India only on the higher mountains where the climate is temperate.

Thalictrum javanicum Blume; *F.B.I.* i 13, IV 16 (*T. glyphocarpum* W. & A. l); distinguished by its maiden-hair-fern foliage, and tall well-branched stem ending in a loose panicle of fluffy balls of white stamens.

Stem and branches slender, grooved, glabrous. Leaves ternately decompose, i.e., of three or more pinnae, these again of three or more sub-pinnae, which have three leaflets; radical leaves a foot long, upper smaller and less compound. Leaflets $\frac{1}{2}$ to 1 inch, broadly ovate or oval, indented in three or four shallow teeth at the end, thin, glabrous, with veins prominently raised on the lower side. Petiole not sheathing; stipules thin, fimbriate, adnate to the petioles and standing out like ears. Panicle loose, few flowered; pedicels $\frac{3}{4}$ inch, spreading; bracts small, persistent. Flowers $\frac{1}{4}$ inch across. Sepals soon falling. No petals. Stamens white, thickened upwards; anthers not pointed. Achenes $\frac{1}{8}$ to $\frac{1}{6}$ inch with short, curved beak. t. 3. Wight l. t. 48, ex. stamens.

In damp places. Pulneys: in Kodaikanal in the swamp near Tinnevely settlement, flowering summer. Nilgiris: on Doddabetta. Not on the Bombay Ghats, north of the Nilgiris. Bourne 300.

Gen. Dist. Anamalais, Ceylon, Sikkim, Simla and Khasia, Thibet and Java. As grown here the leaves are rather larger than those from Java.

RANUNCULUS.

F.B.I. I VII.

Buttercup, etc.

Annual or perennial herbs. Leaves mostly from the rootstock, those of the flowering stems usually small and

less divided; petiole with distinct sheathing base; blade usually, but not always divided more or less completely into three wedge-shaped segments which again have teeth of various depths. Flowers solitary or paniced at the ends of the stem and leaf-opposed branches. Petals yellow, white, or red, with a small pocket containing honey at the base; usually with a deep gloss which is supposed to be a protection against scorching by reflecting the heat of the sun. Stamens numerous. Carpels many, one-seeded; in fruit forming a globular head, and differing in the various species as regards thickness and surface markings.

A large genus of 160 species, scattered all over the world in temperate climates (in the tropics on mountains). In Britain there are fifteen species, known popularly as Buttercup, Celandine, Pilewort, Spearwort, Water-crowfoot, etc. India has about twenty-one species, all but three on the Himalayas; and none of our three indigenous species occurs north of the Nilgiris.

Named after the Latin RANA, a frog, because several species grow in or near water.

Leaves not divided nor deeply cut; flowers a rich yellow. . . .

R. reniformis.

Leaves deeply cut but not to the base of the blade, carpels covered with hooked spines *R. muricatus.*

Leaves compound or cut to the base into three to five segments, which are again cut and toothed. Tufted plant; leaves glossy, their lower sides not whitish; flowers 1 inch across. .

R. subpinnatus.

Diffuse plant; leaves not glossy, their lower sides pale; flowers under $\frac{1}{2}$ inch. *R. wallichianus.*

Ranunculus reniformis Wallich 4709!; *F.B.I.* i 16, VII 4. Perennial herb, stem mottled red and green. Leaves mostly from the ground, rather thick, kidney-shaped or broadly ovate, crenate with red margin and white tips to the teeth, glabrous: stem leaves smaller. Flowers yellow with high gloss. Petals variable in number. Achenes small massed into a compact nearly globular head. t. 4. Wight Ic. t. 75, Ill. t. 2.

In damp spots on the open downs, quite common. Pulneys : above and round Kodaikanal. Nilgiris : all over the plateau. Koondahs. *Fyson* 318. *Bourne* 19, 5124.

Gen. Dist. On the mountains of South India only. Its nearest ally appears to be *R. sagittifolius* *Hook.* of Ceylon which differs in the much more cordate base of the leaf ; and it links that species with *R. lingua* *L.* (*Eng.* Great Spearwort ; *Fr.* Douve ; *Ger.* Yungen Hahenfuss) which occurs in Kashmir and the Western Himalayas.

***Ranunculus subpinnatus* Wight and Arnott ; Herb. Wight Prop. ! ; F.B.I. i 19, included in *R. diffusus* *DC.* ; VII 15 * ;** an erect, tufted, glossy plant with large yellow flowers. Roots thick, white. Leaves mostly radical : petiole 2 to 5 inches with large sheathing base : blade divided into three or five distinct leaflets, glossy and sometimes almost glabrous on the upper side, often densely pilose below ; each divided more or less completely into three wedge-shaped segments, themselves cut and toothed, the ultimate teeth with hardened tips pointing rather forwards. Flowering stems a foot high, hairy ; the lower leaves like the radical ones ; the upper smaller and with only three leaflets ; branches 2 to 4 inches, spreading. Flowers $\frac{1}{2}$ to 1 inch, petals round, with numerous parallel veins. Achenes not as thick as broad, with distinct margin and finely pitted centre. t. 5. Wight Ic. t. 49.

Nilgiris : Ootacamund flr. July. *Bourne* 4601. *Wight*.

* var *evershedæ* leaves smaller and more delicate. Pulneys : on the bank of the stream which flows down the Fairy falls above Kodaikanal ; flowering in summer.

The species was included in the *F.B.I.* under *R. diffusus* *D.C.*, a species founded on a Nepal plant of Wallich's I have not seen De Candolle's type sheet, but Wallich's *R. diffusus* *DC.* in *Herb. Hook.* at Kew, is clearly a diffuse plant rooting at the nodes and with small, apparently white, flowers on leaf opposed peduncles, in habit therefore much more like *R. wallichianus* *W. & A.* Wight's *R. subpinnatus* *W. & A.* collected on the Nilgiris is a sturdier plant, not rooting at the nodes. I have, therefore, retained Wight and Arnott's name. The Pulney plant has the same hardened tips to the teeth of the leaves and the same loosely appressed hairs on the peduncle, but is so much more delicate in foliage and has so much more markedly radical tufted leaves, that while including it under

R. pinnatus I have ventured to call it a variety, naming it after Mrs. Evershed of the Observatory, Kodaikanal, who first showed me the plant. But it is just possible that this is a new species

***Ranunculus wallichianus* Wight and Arnott ; Wight Herb. Prop. ! ; F.B.I. i 20, VII 19 ;** common Buttercup. A gregarious herb spreading by runners, with soft not glossy leaves, and small flowers. Roots thin and fibrous. Radical leaves digitately trifoliate, not glossy above, light green below, sparingly hairy on both sides and soft to the feel ; leaflets deeply cut into three segments which are again cut and toothed, the teeth pointing forwards rather than outwards and not ending in firm points. Flowering stems 3 to 4 inches only, their lower leaves three-fid but upper entire. Pedicels $\frac{1}{2}$ to 1 inch. Sepals reflexed. Corolla $\frac{1}{2}$ inch. Achenes orange-tipped, with distinct margin and few and conspicuous warts on the sides.

Easily distinguished from *R. subpinnatus* W. & A. by the diffuse habit, softer leaves, smaller flowers, reflexed sepals, and shorter pedicels. t. 6. Wight Sp. Nilg. t. 5, Ic. t. 937.

In cool shady spots, very common, in and about both Ootacamund and Kodaikanal, and all over the two plateaus. In damp places succulent. *Fyson* 360, 797. *Bourne* 233, 4600.

Gen. Dist. Mountains of South India and Ceylon. Allied to *R. arvensis* (Eng. Corn Celandine ; Fr. Ren depress) and also to the next species.

***Ranunculus muricatus* Linn. ; F.B.I. i 20, VII 20 ;** distinguished by its deeply slit leaves and by the conspicuous spines on the comparatively large and flat achenes. A much larger plant than the two preceding, running to 2 feet in height. Radical leaves long stalked ; blades roundish cut to below the middle, but not to the base, into three lobes which are again cut in three or more teeth. Flowers terminal and leaf-opposed ; pedicels $\frac{1}{2}$ to 1 inch. Achenes $\frac{1}{5}$ to $\frac{1}{4}$ inch, with strong margin,

hard curved beak, and spines perhaps $1/20$ inch long on the flat sides. t. 7.

In gardens and under hedges in Ootacamund, not indigenous.

Gen. Dist. A weed of cultivation, native of temperate America and Europe, but not England.

MAGNOLIACEÆ.

F.B.I. 3.

The **Magnoliæ** (the greater number of the family) are trees with alternate simple leaves and large hood-like stipules which cover the buds and are pushed off as each expands, leaving scars round the axis. (The only other trees with such stipules are the Figs or Banyans and their allies, but they are quite different and are distinguished further by having a glutinous milk-white juice.) The flowers are large, of nine, twelve or fifteen sepals and petals; numerous slender stamens; and a number of carpels arranged spirally on a convex or tall centre. This central *torus* may grow enormously and become a stalk 3 to 4 inches long, on which the carpels, now $3/4$ inch or more thick, look very much like the separate fruits of as many distinct flowers.

The family is a comparatively small one of about ten genera and seventy species, and has its home on the western shores of the Atlantic and Pacific,—from Virginia to Louisiana and again in Japan and Eastern Siberia extending across China to the Himalayas (see map on page 10). There appears to be only one species native to these hill-tops, but the American Tulip-tree or Lyre-tree, *LIRIODENDRON*, has been planted near Lovedale.

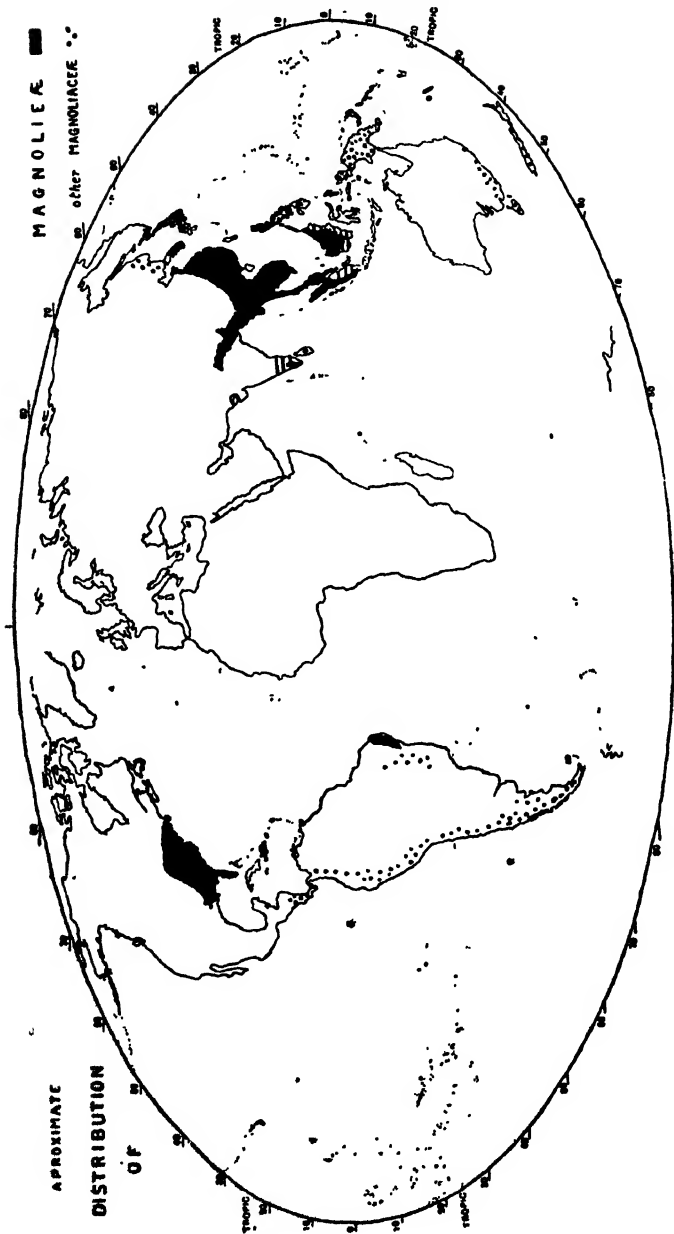
Named MAGNOLIA in honour of Pierre Magnol, a Professor of Medicine at Montpellier (b. 1638). The anomalous genera outside the tribe MAGNOLIÆ are by some placed in another family.

MICHELIA.

F.B.I. 3 VI.

Flowers large and bisexual; anthers opening inwards; *torus* stalked below the carpels (distinction from **MAGNOLIA**); ripe carpels opening widely to let out the

MAGNOLIACEÆ.



seeds. Species sixteen, all on the tropical mountains of Asia (India, Malaya, China).

Named in honour of Antonio Micheli, a Botanist of Florence.

Michelia nilagirica Zenk.; *F.B.I.* i 44, VI 8. Stem white; twigs erect; buds long, silky, leaves elliptic, acuminate, entire, hard, glabrous and shiny, flat or drooping. Flowers white or a pale cream colour, of nine to twelve oblong or obovate, easily crushed and quickly fading sepals and petals. Stamens numerous with very short swollen bases and slender anthers of $\frac{1}{2}$ inch with small tips. Fruiting torus erect, 3 to 4 inches; carpels covered with white warts and opening by a slit beginning on the outer side. Seeds two, red, the outer coat soft with a mango smell, inner hard; completely filling the carpel, and attached close together, the upper with its micropyle just above or to one side of the hilum, the lower with it just below; funicle at first remarkably elastic. t. 8. Wight Sp. Nilg. t. 6 = Ic. t. 938; Ill t. 5 (ex. carpels fruit and colour of flower).

In all the higher sholas, very common—Ootacamund, Kodai-kanal and above. Not apparently below 5,000 feet. *Fyson* 557, 1752,* 1893, 2064. *Bourne* 250, 2043, 2221.

With reference to the distribution of the seeds, see note on *Ternstroemia japonica* *Thunb.*, p. 41.

Michelia champaca Linn.; *F.B.I.* i 42, VI 2; with leaves 6 to 10 inches long, tapering to a long point and fragrant yellow or orange flowers is occasionally found in gardens, e.g., Trewin near the bund at Kodaikanal, *Fyson* 2787. At Poombari, *Bourne* 722.

MENISPERMACEÆ.

F.B.I. 5.

A family of slender twining plants with alternate leaves usually attached to the stalks inside the margin, small unisexual dioecious flowers in axillary umbels

and fleshy fruit with its stone and enclosed embryo curved into a horse-shoe or crescent shape. The parts of the flower are usually in sixes, except that there may be only one carpel, or in some species as many as twelve. The curved stone is the most characteristic feature, and gives the name to the family (*menis* = the crescent moon, *sperma* = a seed).

Genera 58. Species 200 ; in the warmer parts of the world.

STEPHANIA.

F.B.I. 5 XII.

Leaves peltate, sepals six to ten ; petals three to five shorter ; stamens connected together as a column in the centre of the flower with a broad top along the edges of which the anthers open by horizontal slits ; carpel one only with three-partite style ; stone of fruit tubercled along the back, hollowed at the sides.

Species about 30, in Asia, Africa and south Australia.

Stephania hernandifolia Walp. ; F.B.I. i 103, XII 1. A tender twining plant, with heart-shaped leaves attached inside the margin, and small heads, not $\frac{1}{4}$ inch across, of minute flowers, in stalked umbels of three to five heads. Distinguished at once by these characteristics from all our plants.

Stem slender, angled, glabrous, as also the whole plant. Leaves alternate, stalks $\frac{3}{4}$ inch, blade usually $1\frac{1}{4}$ by $1\frac{1}{2}$ inches but up to 6 inches diameter (F.B.I.) broadly ovate, or triangular with the basal corners round, 2nd nerves radiating from the point of attachment. Stalks of umbels 1 inch, but variable ; stalks of the heads 0 to $\frac{1}{4}$ inch, in the axils of small narrow bracts. Male flowers numerous, $\frac{1}{8}$ inch across or slightly more when fully expanded. Sepals six or eight, in two series, oblong. Petals opposite the outer sepals, about half as

long, thick and concave. Stamens not separate, but combined into a solid column, $\frac{1}{20}$ inch high, expanded at the top round which the anthers open all in one line, horizontally. Ovary flowers similar, with one carpel only. Fruit a red glabrous drupe $\frac{1}{5}$ to $\frac{1}{4}$ inch; the stone inside horse-shoe-shaped with tubercled ridges along the back and hollow sides. Seed inside annular with longitudinal cotyledons. t. 9. Wight Ic. t. 939 Sp. Nilg. t. 7 (Clyphea).

A lowland plant reaching the lower limits of our area, Wellington! Very occasionally at higher levels:—e.g., on the exposed top of hill north of Vengadu, on the edge of the plateau at 7,200 feet! *Fyson* 2684.

BERBERIDACEÆ.

F.B.I. 6.

BERBERIS and MAHONIA the only genera here, as in Europe, of this family are distinguished by their yellow globular flowers, of rounded sepals and petals in four circles of three each; their anther lobes opening, not by slits as in nearly all other families but by large lateral flaps; and the ovary of one carpel only, which in fruit becomes fleshy and has one or more seeds.

The family is almost confined to the north temperate regions of Asia and America, being absent from Africa, south of Algeria, Australia, and the Pacific islands, and from all but the highest mountains of South America. There are forty-nine genera, and some 140 species in the tribe *Berberææ*, and most of these occur on the Pacific coasts of North America and northern Asia.

In Europe the best known species of *Berberis* is *B. vulgaris* L., the common Barberry or Pipperidge, a hedge-row shrub, which was much commoner before the discovery that it harboured the Rust-disease of wheat. But several introduced species are common in gardens, as also of *Mahonia*.
Berberis is an old Arabic name.

Leaves simple, in bunches just above a three-pronged spine;
the common Barberry BERBERIS.
Leaves pinnate, radiating usually from the top of the stem;
leaflets prickly like Holly MAHONIA.

Berberis tinctoria *Leschenault*; *F.B.I.* i 110, included in *B. aristata* *DC.*; IV 4*; common Nilgiri Barberry. A shrub, but very variable in size and form; in the open often only 2 or 3 feet high, but in a shola sometimes reaching 15 feet with stem as thick as one's arm and long scandent branches bearing numerous slender leafy twigs; wood very tough, bright yellow in colour. Leafy twigs green or purple, grooved and angular, studded with triple spines in the axils of which are tufts of leaves. Leaves green or when young purplish, obovate, entire or with a few spiny teeth, glabrous, 1 to $2\frac{1}{2}$ inches. Racemes of flowers drooping, sometimes branched; pedicels slender. Sepals six or seven, the three inner larger and spreading. Petals six erect, roundish, notched. Stamens six; anthers broad. Berry sausage-shaped when young, eventually top-shaped, $\frac{1}{3}$ by $\frac{1}{6}$ inch, purplish red, turning to a dark-blue with glaucous bloom, with the dry style and large round stigma still attached. t. 10 & 11. Wight Ill. t. 8.

Distinguished from *B. aristata* *DC.* by the slender drooping pedicels and the shape of the fruit.

By road-sides, on the edges of and inside sholas; quite common. Nilgiris: Ootacamund, Pykara, Kotagiri. Pulneys: Kodaikanal downs. *Fyson* 302, 1034, 2232, 2587. *Bourne* 475.

Schneider in *Bull. de L'Herbier Boissier*, Ser. 2. 5. 1905, p. 432 divides the Nilgiri specimens into three species, *B. tinctoria*, *B. wightiana*, and *B. ceylanica*, by the colour and surface of the under side of the leaves, the hairiness of the twigs, and the inflorescence. I am not, however, able to distinguish these.

Mahonia leschenaultii *Takeda* (*Berberis leschenaultii* *Wallich* *Cat.* 1479!); *F.B.I.* i 109 included in *B. nepalensis* *Spr.*, IV * 1; the Holly-leaf Barberry. Stem slender or stout, sometimes almost a tree with rough, greyish-brown, corky, bark; branches slender. Leaves in circles at the ends of the branches, 6 to 18 inches long, pinnate with two filiform stipules, $\frac{1}{6}$ to $\frac{1}{4}$ inch. Leaflets five to twenty-five in pairs, with one terminal, increasing in size

towards the end, and in shape from polygonal close to the base (like a pair of large stipules) to ovate at the outer end, lobed and spiny. Flowers in dense, erect, racemes or spikes, 5 to 7 inches long. Bracts triangular-acute, conspicuous. Sepals six or seven, the three inner larger and spreading. Petals six, erect, roundish, notched. Stamens six; anthers broad. Stigma large, round. Fruit globular, the size of a pea; containing four or five seeds attached rather to one side of the base; stalk slender. t. 12. Wight Sp. Nilg. t. 8, lc. t. 940.

Distinguished from the Himalayan *M. nepalensis*, *Spr.* by the more globular fruit and slenderer pedicels.

On the outskirts of sholas, at high elevations very common. Nilgiris: Ootacamund, Pykara. Pulneys: Kodaikanal downs. *Fyson 2602. Bourne 309.*

The arrangements for cross-fertilization appear to be the same in both species and exactly as in the common Barberry of England. Honey is secreted by nectaries at the base of the stamens, and is partially protected from rain by the concave petals in the ordinarily half-drooping position of the flower. The stamens are very sensitive, and when an insect probing the base of the flower for honey touches them the filaments move inwards so that the insect's head or proboscis is touched by the anthers and carries away pollen to another flower. The stigma being large and round cannot fail to receive pollen if the insect visits a flower with the side that is dusted with pollen inwards. Self-fertilization will occur, if pollination be not previously effected, by the stamens moving in when the flower fades. The flowers are thus adapted to the visits of short-tongued insects (beetles and bees).

The distribution of the seeds is by animals attracted by the sweet flesh of the berries, which as in so many other cases suffer a distinct change in colour as they ripen. Birds are probably the chief agents.

CRUCIFERÆ.

F.B.I. 10.

One of the largest and most useful families in regions of temperate climate, the CRUCIFERÆ have but few

representatives here; and on the plains of South India none but the cultivated Mustard, Cabbage, Radish and other vegetables.

The chief features of the family are the very regular arrangement of the four petals with their narrow upright stalks and spreading blades; the six stamens arranged two opposite two sepals, and two pairs of longer ones opposite the other two sepals; and the two-celled ovary with seeds on the side-walls not in the centre of the partition as in all other two-celled ovaries. The peculiar arrangement of the stamens is because each of the pairs is formed by the splitting of a single rudiment. The flowers are always in racemes without bracts to the pedicels, and the fruit is a dry pod opening by the two sides coming off and leaving the partition with the seeds often still attached to its edges.

There are usually two honey glands at the feet of the two single and shorter stamens causing them and the corresponding sepals to bulge out a little.

The family is found all over the world, but chiefly round the Mediterranean. Common garden plants are *CHEIRANTHUS*, Wall-flower, *Ger.* Goldlack, *Fr.* Violier or Giroflée jaune; *IBERIS*, Candytuft, *Ger.* Baurensenf; *MATHIOLA*, Stock or Gilly-flower, *Ger.* Leukoje rote, *Fr.* Giroflée.

Species of *BRASSICA* are cultivated for their seeds (Rape and Mustard), their tuberous roots (Turnip), their edible leaves (Cabbage, Brussels-sprouts, Savoy, Kale), or their much enlarged inflorescence (Cauliflower). The common Watercress, *Nasturtium officinale L.*, is another of the family.

For distinguishing the genera importance is attached to the shape of the pod, whether long and narrow as in the Wall-flower, or broad and thin, and in the latter case whether the partition is across the narrower diameter as in the Shepherd's Purse, or the broader as in Honesty; and further to the relative position of the radicle and the cotyledons in the seed, whether the radicle lies along their edges as in the Wall-flower and Stock, or across them when they are folded over it as in the Cabbage.

This distinction can be seen without difficulty in the ripe and dried seed, since there is no endosperm and the seed coat fits tightly over the embryo. When one groove only shows on the surface it is the division between the radicle and the cotyledons (i.e., the radicle lies along their edges), when two grooves are seen they separate the radicle in the centre from the cotyledons which wrap round the other side of it.

Named in allusion to the spreading of the four petals in the form of a cross.

A. Pod long and narrow, radicle along the edges of the cotyledons (seed has a line a little to one side of the middle).
Flowers white or whitish. CARDAMINE.

Lower leaves three-foliate, toothed. C. africana.
Lower leaves pinnate or pinnatisect. C. hirsuta.

B. Pod long and narrow, indented between the seeds. Radicle across the cotyledons (seed has two grooves).

Lower leaves broad, lyrate; upper narrower, finely toothed.
Flowers yellow. . . Mustard BRASSICA juncea.

C. Pod short, as broad or broader than long.

Partition across the narrower diameter. Pod heart-shaped
. . Shepherd's Purse CAPSELLA bursa-pastoris.

CARDAMINE.

F.B.I. 10 VIII.

Bitter-cress, etc.

Herbs. Leaves usually pinnatisect. Flowers white or purple. Pod narrow, opening by two valves. Seeds in one row only; radicle of embryo along the edges of the cotyledons.

Species about fifty over the whole of the temperate and arctic regions.

Named on account of the use the leaves were once put to as a cure for that form of indigestion which produces palpitation of the heart, from the Greek KARDIA a heart and DAMAO I subdue. Compare the name Cardamon for the spice which has the same property. But the Greek KARDAMON was also the common garden Cress.

To the genus belong the English wild plants, Cookoo-flower, Bitter-cress; the German Gaucheblume, Wiesenkresse, the French Cresson-nette,

Cardamine africana Linn.; *F.B.I.* i 137, VIII 3. A small perennial herb with long-stalked, pinnately three-foliate leaves, small white flowers, and slender rather erect pods. Leaflets broadly ovate, toothed, slightly hairy; lateral ones oblique, and asymmetrical at the base; about 1 inch by 1 inch. Main stem very often ending soon in a raceme of flowers, with leaves and axillary branches continuing on one side. Pods $1\frac{1}{2}$ by $\frac{1}{20}$ inch. t. 13. Wight Sp. Nilg. t. 9, Ic. t. 941 (*C. borbonica*).

Very common in sholas. In the higher mountains of India and Ceylon. *Fyson* 1355, 1851, 2847. *Bourne* 258, 508, 556.

Gen. Dist. Mountains of tropical Africa and south temperate regions.

Cardamine hirsuta Linn.; *F.B.I.* i 138, *Wall. Cat.* 4781 ! not 4780; VIII, 6. Hairy Bitter-cress. An annual herb very variable in size and in the toothing of the stem leaves, hairy or quite glabrous. Stems tufted from a very short rootstock, spreading. Leaves mostly radical but also on the stem; leaflets five to seven, from ovate-cuneate to reniform, almost entire or coarsely three-lobed, terminal one largest; of the stem leaves much narrower almost linear: or in larger forms with several rounded teeth. Flowers small, white. Pods slender, $\frac{3}{4}$ by $\frac{1}{30}$ inch, to $1\frac{1}{4}$ by $\frac{1}{20}$ inch, tapering off at the end; stiffly erect or slightly spreading. Seeds brown, circular. t. 14.

Nilgiris: Pykara. Pulneys: on the downs. Very common on the higher hills of South India. *Fyson* 2930. *Bourne* 429.

Gen. Dist. All over the temperate parts of India, and in Bengal during the cold weather, and generally in all temperate countries including England.

BRASSICA.

F.B.I. 10 XXIV.

Cabbage, Mustard, etc.

Well branched biennial or perennial herbs with bluish foliage. Flowers usually yellow in long leafless

racemes. Pods long cylindrical, ending in a round beak and large stigma. Seeds roundish, in one row; radicle across the cotyledons which are wrapped round it.

Species about fifty, in the Mediterranean region, central Europe, and central and eastern Asia.

Named from the old Celtic name BRESSIC (Cabbage) or possibly from the Greek BRAZEIN to cook.

Brassica juncea *J. D. Hooker and Thompson; F.B.I. i 157, XXIV 6; Indian Mustard.* An annual growing to 4 feet. Lower leaves elliptic or oblong lanceolate, irregularly toothed, and with often irregular triangular segments on the long and wide stalk; upper leaves narrower, lanceolate and more regularly toothed. Stalks of the flowers $\frac{1}{4}$ to $\frac{1}{3}$ inch. Pods 1 inch or more, with a long beak tipped by the stigma. t. 15.

Cultivated all over India, and from Egypt to China. *Bourne* 700, 734.

CAPSELLA. F.B.I. 10 XXVIII.

Pod broad and flat with partition across the narrower diameter; heart-shaped; its halves boat-shaped, keeled, many seeded. Radicle lying across the cotyledons. Small herbs with white flowers and lobed or entire leaves.

Species four, in temperate climates of both hemispheres.

Capsella bursa-pastoris *Medic.; F.B.I. i 159, XXVIII 1; Shepherd's Purse.* Lower leaves usually lying on the ground as a rosette, lobed or deeply cut; stem leaves few, oblong or lanceolate, clasping the axis by large ear-shaped bases. Flowers in terminal racemes, white. Pods with the partition showing down the middle of each side. Seeds oblong. t. 16.

A weed of cultivation nearly all the world over except in tropical climates. To be found in flower at all seasons because very quick to mature. At once recognisable by its pod. *Bourne* 1949.

Named from CAPSELLA, a little capsule; BURSA-PASTORIS the literal Latin for Shepherd's Purse, an old and universal name. Ger. Hirtentasche; Fr. Bourse de Berger.

CORONOPUS (SENEBIERA). F.B.I. 10 XXX.*

Annual or biennial prostrate branching herbs with leaf-opposed racemes of small white flowers characterised by the fruit being composed of two globular one-seeded parts.

Species about twelve, mostly in subtropical climates.

Coronopus didyma Linn. (Senebiera Poir); XXX* 1; Wartcress. A small weed. Leaves $\frac{1}{2}$ to $1\frac{1}{2}$ by $\frac{1}{2}$ inch, deeply pinnatifid into narrow leaflet-like segments. Fruit of two globular parts each $\frac{1}{12}$ inch.

A native of tropical America now spread as a weed in many lands. Ootacamund road-sides.

VIOLACEÆ.

F.B.I. 13.

A family of twenty-one genera of which the most important is VIOLA.

VIOLA.

F.B.I. 13 I.

Violet, Pansy, etc.

The flower of the Violet, the only genus here, as in Europe of this family, is probably known to all. There are five pointed sepals, produced backwards at the base; five petals, four of them normal, the fifth and lowest rather larger and produced backwards as a hollow spur; five stamens with short broad filaments, large anthers, and small brown flaps surmounting them; and a central one-celled ovary with three rows of seeds attached to the wall, and a single style. Two of the stamens have extensions running back into the spur of the lowest petal, and when these are jogged by the proboscis of a bee or other insect, while it is sucking the honey secreted

inside the spur, pollen is shaken out of the anthers, where it had been held in by the flaps, onto the insect's back. When the insect visits another flower of the same species cross-fertilization is effected. Pollination would often not take place in wet weather for lack of insects; and to compensate for this there are often other flowers, very much smaller, which do not open at all, but are fertilised by the pollen growing directly out of the anthers onto the stigma (of the same flower). The fruit is a round or oblong capsule which splits into three boat-shaped pieces with a row of seeds down the middle of each. All are small perennial herbs, with alternate or radical, often heart-shaped, long-stalked leaves, and conspicuous stipules. Flowers solitary on long slender stalks, which bear a small bract about two-thirds the way up.

Species 300 all over the world but mostly in temperate regions and the mountains of the northern hemisphere.

Many are peculiar to the Andes of South America, a few occur in Brazil, South Africa, and tropical Africa; eight in Australia and New Zealand, five in the Sandwich Islands.

Named from the old Greek name ΙΟΝ, for a common European species.

Plants of the open grass land, not connected by runners; leaves much longer than broad *V. patrinii*.
Shade-loving plants, usually connected by runners; leaves heart-shaped.

Sepals ovate-obtuse; stipules almost entire; branches and internodes very long. *V. distans*.
Sepals long-attenuate from a lanceolate base; stipules lacinate or deeply toothed *V. serpens*.

Viola patrinii DC. ; *Wall. Cat.* 1445 !; *F.B.I.* i 183, I 2; the Spear-leafed Violet. Rootstock stout and woody, without runners. Leaves variable, but usually lanceolate, abruptly narrowed at the base, finely but distantly serrate or crenate, glabrous; blade 2 to 3 inches; stalk long and clasping the rootstock at the base. t. 17. *Wight Ill.* t. 18 (*V. walkerii*).

On the open downs, in grass, quite common. *Fyson* 361, 1835, 1841. *Bourne* 22.

Gen. Dist. Mountains of India, Ceylon, Thibet, and over North Asia from Russia to Japan.

Viola distans *Wall.* Runners long, bearing leaves at intervals of $\frac{1}{2}$ to 12 inches. Stipules almost entire. Radical leaves with petioles of as much as 7 inches and reniform blades. t. 18.

Pulneys: near Poombari and in the Pambar ravine. Nilgiris: Kotagiri (Sir F. Adams). *Bourne* 742, 743, 4669.

Gen. Dist. Himalayas, Khasi hills, Ceylon and perhaps Java. I have not myself found this and I doubt whether it grows as high as our area (i.e., about 6,500 feet). But I have added it here in case it should be found.

Viola serpens *Wallich*; *Wight's Kew dist.* 741; *F.B.I.* i 184, I 6; Pulney Wood Violet. Branches and runners very slender and long, rooting occasionally at the nodes. Stipules lanceolate, deeply toothed. Petioles 1 to 3 inches, slender; blades delicate, hairy, triangular-cordate, with a deep rounded sinus at the base: teeth pointing forward blunt or snub-nose-shaped. Normal flowers $\frac{3}{4}$ inch across. Sepals $\frac{1}{5}$ by $\frac{1}{20}$ inch. Cleistogamic flowers white, $\frac{1}{20}$ inch on peduncles of less than 1 inch. Capsule round, $\frac{1}{4}$ inch. Seed pointed aril on one side of the top. t. 19. *Fyson* 2093.

In moist places, inside sholas, on the Pulney downs.

* *var. canescens* *Wall. Cat.* 1442! a closely tufted plant with hardly any stem, and no long runners. Stipules very lacinate, flowers 1 inch across. In cool places. *Fyson* 1926.

** *var. wightiana* *Wall. Cat.* 4021! (not *confusa* Benth.) In habit intermediate between the former two. A robust plant, with petioles up to 5 inches, blades to 2 inches, and large sepals, Nilgiris and Pulneys flowers September. *Wight Sp. Nilg.* t. 11—Ic. t. 943 but add runners. *Fyson* 301, 311, 2093^b, 2980, 2981. *Bourne* 202, 225.

Wight's illustration, Ic. t. 943, does not show stolons, and his plant was probably for this reason included in var. 3 of the *F.B.I.* But the plant referred to in *W. & A. Prod.*, i.e., *Wall.* 4021, has them. *V. confusa* *Benth.* (var. 3 of *F.B.I.*) is quite different.

PITTOSPORACEÆ.

F.B.I. 15.

A family of nine genera and ninety species chiefly Australian, of which fifty belong to one genus PITTO-SPORUM.

PITTOSPORUM.

F.B.I. 15 I.

Sticky-seed.

The name, PITTOSPORUM, or Sticky-seed, indicates the chief characteristic of this genus—the yellow sticky pulp in which the seeds are imbedded. Another useful characteristic is the umbelled arrangement of the smaller branches and the crowding of the leaves at their ends.

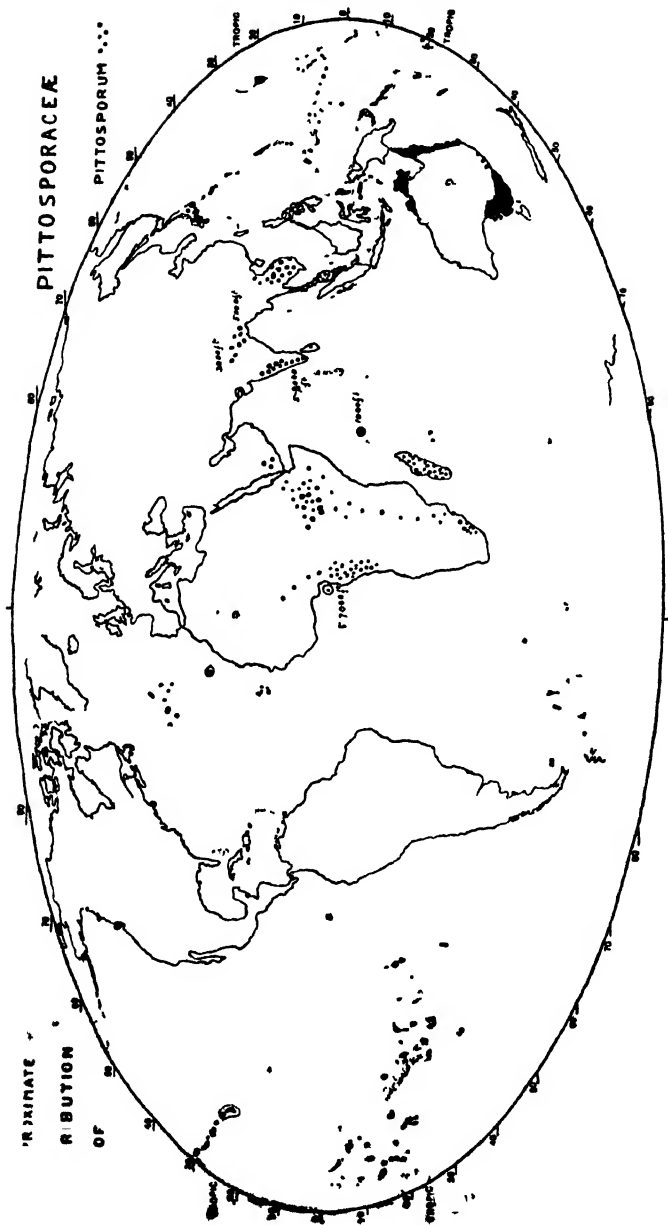
Flowers in umbels or corymbs close down among the young leaves, white or yellowish-green in colour. Calyx small, greenish. Petals five, yellowish, oblong. Stamens five, alternating with the petals. Ovary covered with short stiff erect hairs, and ending in a short stiff style; incompletely two-celled. Fruit a small berry, with short persistent style, and marked on the outside with a vertical equator along which the rind splits open and spreading out flat exposes the red or orange sticky seeds.

Species about 50 in the tropical and subtropical regions of Australia, Asia, Africa, and the Pacific islands.

The family is a comparatively small one of only 100 species, and chiefly Australian. See map on page 24.

Flowers on short, stout pedicels, umbelled at the ends of the twigs. Common sticky-seed . . . *P. tetraspermum*.
Flowers on slender pedicels in racemes from among the uppermost leaves, forming a loose corymb . . . *P. nilghirense*.

Pittosporum tetraspermum *Wight and Arnott; Herb. Wight No. 1421; F.B.I. i 198, 13; Cherry Orange, or Common Yellow Sticky-seed.* A small tree with thick



trunk and grey bark (usually covered with flat encrusting lichens). Twigs straight, thickly studded with yellow pustules (lenticels); usually in bunches of three or four together. Foliage rather thick and dark. Leaves whorled at the ends of the twigs, or at the forkings, elliptic or oblanceolate, quite glabrous, leathery, dull, dark green on the upper side, lighter below, with slender but on the lower side quite distinct veins; stalk $\frac{1}{4}$ inch. Pedicels $\frac{1}{6}$ inch lengthening to $\frac{3}{4}$ inch in fruit; stout, umbelled or in short irregular racemes. Sepals small triangular. Petals creamy yellow, curved backwards. Stamens stiff, half the length of the petals. Style $\frac{1}{16}$ inch; stigma capitate. Fruit $\frac{1}{2}$ inch round, in colour and shape much as an orange when ripe. Seeds three or four, imbedded in orange-coloured sticky flesh, which smells strongly of turpentine. Endosperm white. t. 20. Wight Ic. t. 971 ex. stigma.

In and at the edges of sholas, quite common. Nilgiris: in and round Ootacamund. Pulneys: on the downs. Flowers December-March. Fruit summer. *Fyson* 1853, 1853, * 1858, 1925, 2210, 2211, 2620. *Bourne* 422, 1798.

Gen. Dist. Western Ghats, Shevaroy, Anamalais and Ceylon only.

Pittosporum nilghirens *Wight and Arnott; Herb. Wight No. 1411; F.B.I. i 198, I 4.* Nilgiri Sticky-seed. Very similar to the last in general habit and in leaf; but the flowers in loose racemes of 1 to 3 inches with pedicels of $\frac{1}{2}$ to 1 inch terminating the twigs or in the uppermost leaf-axils. Wight Ill. i. t. 70.

Nilgiris: Kotagiri, Sispara, Ootacamund. Pulneys at lower levels. *Fyson* 3000, 1717, 2111. *Bourne* 330, 605 *, 777 *, 1449.

Gen. Dist. Western Ghats, Nilgiri, Pulney and Anamalais.

Pittosporum floribundum *Wight; F.B.I. i 199, I 6;* occurs on the Kodaikanal ghat below Shembaganur, flowering profusely in the autumn and is then very conspicuous.

POLYGALACEÆ

F.B.I. 16.

A family of ten genera and about 700 species, occurring all over the world but only rarely in the Arctic regions, Polynesia, and New Zealand. POLYGALA is the chief genus.

POLYGALA.

F.B.I. 16 I.

Milkwort.

Flower in general appearance very like that of the Pea, there being a pair of spreading wings (the two inner and lateral sepals) and a keel (the lower petal); but at once distinguished from that family by a fringe at the tip of the keel, and in essential details quite distinct. Sepals five, of which three are small. Petals three only, the anterior one boat or keel-shaped. Stamens eight, united together at the base and to the keel: anthers free, opening by pores at the ends. Ovary two-locular: fruit a flat oval capsule, winged slightly along the edges except at the top, where is a notch. Seeds one only in each loculus, pendulous, large and with a branched appendage (aril) which in the different species varies in size. Trees, shrubs or herbs, with simple alternate leaves and no stipules.

Species about 450, in all the temperate and warmer parts of the world.

There is a bract and two bracteoles below the flower, and in some species the latter disappear before the flower opens, in others they persist. In some species also the two larger, *wing*, sepals are green (*herbaceous*) in others coloured (*petaloid*). The aril of the seed may be very large and red, covering nearly the whole seed, or more usually white and then with two or three outgrowths (*arms*) spreading down over the seed, or without any. These characteristics are therefore to be observed for the determination of a species.

Pollination is brought about in much the same way as with the Papilionaceæ. The anthers shed their pollen into the keel and it is pushed out when an insect alights to suck

honey from the base of the flower and depresses the keel by its weight. The species differ in details.

Flowers bright yellow, $\frac{3}{4}$ inch; seeds with large red eye surrounding a black circular disk; shrub. . . . *P. arillata*.

Flowers mauve or pink, $\frac{1}{2}$ inch, in short racemes from the axils of the upper leaves; rootstock woody, stems slender spreading on the ground Milkwort *P. sibirica*.

Flowers solitary in the leaf-axils; annual, erect or spreading, with narrow leaves *P. rosmarinifolia*.

Polygala arillata *Hamilton, Wall. Cat.* 4191 *c and d*!; *F.B.I.* i 200, 11; Red-eye or Yellow Milkwort. Shrub 3 to 6 feet with loosely growing branches covered with light coloured bark. Leaves up to 6 by 3 inches elliptic or oblong-lanceolate, acuminate, entire, waved, glabrous, dark dull-green. Flowers in drooping racemes from the upper leaf-axils, yellow, $\frac{1}{2}$ to $\frac{3}{4}$ inch across: bracts deciduous. Sepals unequal; upper very concave; lateral (wings) oblong-pointed, spreading, yellow, very conspicuous; two lower small. Petals yellow, keel with conspicuous fringe. Capsule almost heart-shaped green till ripe, then straw-coloured and opening on each side to expose the two pairs of seeds. Seed about three-quarters covered by three large red fleshy outgrowths which rise from the base and leave a rounded area at the top. This area a jet black circular patch with a slaty-blue zone round, like the pupil and iris of an eye, in a red fleshy setting. t. 21.

The seed remains some considerable time attached to the dried capsule, which does not fall from the bush. See note on *Ternstroemia japonica* *Thunb.*, p. 41.

Nilgiris: near Ootacamund and below. Pulneys: from Shembaganur upwards. Flowers June, fruit from September. *Fyson* 375, 1089, 1887. *Bourne* 437, 1403.

Gen. Dist. Hills of South India—Western Ghats, Bababooduns, Coorg, Anamalais, etc. Ceylon from 4,000 feet.

Not elsewhere. Nepal and Khasi plants have the flowers in branched racemes, and have been separated by Chodat as *P. tricholopha*. In the *F.B.I.* the wings are given (?Nepal and Khasi) as red-purple, but in our plant they are a clear lemon yellow.

***Polygala rosmarinifolia* Wight and Arnott; F.B.I.** 204, I 13; Rosemary Milkwort. An erect or spreading, well-branched annual, 2 to 18 inches high. Stem very slender throughout, but rigid, pubescent. Leaves $\frac{1}{2}$ to 1 by $\frac{1}{8}$ to $\frac{1}{6}$ inch, narrow linear, erect on the branches, with thickened and recurved margins and strong midrib; but not coriaceous or with the hard apex of *P. sibirica*. Flowers greenish, solitary or in short racemes in the leaf-axils, erect, $\frac{1}{8}$ to $\frac{1}{6}$ inch long. Bracteoles minute, at the base of the pedicel and close against the equally small bract or the subtending leaf. Wings obliquely ovate. Petals rounded: keel with distinctly stalked fringe below the notched end. Pod elliptic, notched at the top, elsewhere with a narrow purple margin. Seeds two, black, covered with short hairs and capped by a large white aril with two short extensions round the scar.
t. 22.

Pulneys: from Shembaganur 5,500 feet upwards. *Bourne* 306, 709. Nilgiris (*H. & T.*, *Hohenacher*).

Gen. Dist. Southern hills of the western Peninsula and Ceylon.

Polygala sibirica* Linn., var. *heyneana (not Wallich 4184!); *F.B.I.* i 205, I 14; Common Milkwort. A small plant with numerous stems $\frac{1}{16}$ inch or less in thickness and four to many inches long, trailing on the ground from a thick perennial rootstock. Leaves nearly sessile, $\frac{1}{3}$ to 1 inch long and usually not more than $\frac{1}{6}$ inch wide, elliptic or oblong, with recurved margins and only one strong vein (midrib) ending in a short recurved point; but when dry marked on the upper side with a fine raised network quite characteristic in containing no straight veins. Flowers in short erect racemes, or occasionally solitary, in the upper leaf-axils; pinkish-mauve or purple. Bracteoles minute, at the base of the pedicel and near the equally small bract or the

subtending leaf, but deciduous before the flower opens. Outer sepals $\frac{1}{8}$ inch inner (wings) $\frac{1}{4}$ by $\frac{1}{6}$ inch, acute, and very slightly oblique. Lateral petals broadly obovate or triangular, joined at the base, usually spreading out horizontally, very conspicuous: keel shorter or longer, with conspicuous fringe. Stamens eight: filaments white, connected into a tube round the style and split in the upper part; anthers yellow, continuous with the filament. Style longer, with conspicuously large spoon-shaped and incurved violet end which arches over the anthers. Capsule $\frac{1}{4}$ by $\frac{1}{5}$ inch flat, surrounded except at the middle of the top by a wing $\frac{1}{20}$ inch wide. Seeds two, black; capped by a small white aril which bears a tuft of hairs at the top and three flat oblong white appendages, with rather broader fringed ends, reaching two-thirds down the seed. t. 23.

From the type species the plant which occurs here differs in the stouter midrib, more recurved margins, oblong leaves, and larger appendages. *Nysson* 1101, 1794, 1857, 1924. *Bourne* 34, 2789.

In the grass of the open downs, very common from 5,500 feet upwards, often trailing over the edges of cattle tracts: flowering from after the early rains. Occasionally with white flowers.

Gen. Dist. Himalayas from Kashmir to the Khasi hills, and beyond to Siberia, China and Japan. In Ceylon, on the highest mountains as a larger form. Not on the Western Ghats to the north of the Nilgiris.

Pollen is shed from the anthers and collects in the hallowed side of the style, and is presented to insects which alight on the flower and depress the keel.

CARYOPHYLLACEÆ.

This is the family of our garden Pink, Carnation, Gypsophila and Chickweed. Its members are all herbs, with sessile simple leaves and conspicuously swollen nodes. The flowers are usually terminal on the branches; sometimes in very regular cymes, as in the common pink Catch-fly of our gardens (*Silene armeria*). The sepals

may be united or free; the petals are always free, and five; the stamens usually twice as many. But the character which distinguishes the family from all others except the PRIMULACEÆ and MYRSINÆ (and they are very different in every other respect), is the one-celled ovary with its large, round, central placenta, on which the numerous seeds are arranged. The seed is deeply indented at the scar, being bent round so that the apex lies near the base; and the embryo inside is in consequence bent round too. This curving of the embryo is characteristic of the order, and so of a few others for that reason considered allied to it.

The family is a large one of 80 genera and 1,300 species, and belongs chiefly to the temperate regions. In India it is practically confined to the Punjab and temperate Himalayas, and to small mountain areas like the Nilgiris and Pulneys. On the plains of Southern India only two species occur wild.

Named from two Greek words KARION a nut, and PHYLLUM a leaf, because the buds consist of ordinary unexpanded and rather long leaves, not short specialised scales, and takes the form of rather hard leafy lumps at the ends of the branches.

- | | | | |
|---|---|--|-------------|
| a | { | Sepals united as a tubular calyx | SILENE |
| | { | Sepals not united | b |
| b | { | Leaves many at a node | c |
| | { | Leaves two only at a node | d |
| | { | Leaves 1 inch or so, semi-cylindrical and grooved underneath; flower in open three-chomotous panicles. (Spurry) | SPERGULA. |
| c | { | Leaves four only at a node, flowers hardly more than $\frac{1}{8}$ inch across, in loose terminal cymes; sepals keeled . . . | POLYCARPON. |
| | { | Lower leaves stalked; stem with a line of short hairs alternately on one or the other side; petals divided and flowers in consequence star-like; capsule not much longer than broad. (Stitchwort). | STELLARIA. |
| d | { | Leaves all sub-sessile; petals notched not deeply divided; otherwise similar to the above. (Sandwort). ARENARIA | |
| | | All leaves sessile; petals notched; capsule two or three times as long as broad, glistening. (Chickweed) . . . | CERASTIUM, |

SILENE.

F.B.I. 18 VI.

Campion Catch-fly.

Calyx tubular (inflated or not), five-toothed, ten-nerved. Petals five, with narrow lower part and spreading upper, often with two swellings at the middle. Ovary often slightly stalked: capsule of firm material, three to five locular at the base, one-locular at the top, opening in six teeth. Seeds kidney-shaped covered with transverse rows of tubercles on the back and sides. Annual or perennial herbs with solitary, cymose, or variously panicked flowers.

Species 300, chiefly round the Mediterranean region. *Ger.* Pechnelke, *Fr.* Attrapemouche.

Named after the drunken, slobbering god, SILENE, because some of the species are covered with sticky secretion.

Silene gallica Linn.; F.B.I. i 218, VI 3. A loose straggling herb with opposite leaves, but the flowers developed only along one side of the stems thus forming unilateral racemes. Stem or branches erect or ascending, 4 to 18 inches. Leaves oblong or oblanceolate about 1 by $\frac{1}{8}$ inch, sometimes sticky. Flowers nearly sessile in the axils of one of each pair of upper leaves. Calyx tube $\frac{1}{3}$ to $\frac{1}{2}$ inch, hairy, ten-ribbed. Petals not much exerted from the tube, pink, each with two scales one-third from the top. Styles three. Capsule egg-shaped. Seed with rows of tubercles, and an ear-shaped depression on each side. t. 24.

As a weed by road-sides, etc.

Gen. Dist. A weed of cultivation in all parts of the world, native of Europe. *Fyson* 3003.

Silene armeria Linn.; an annual herb with regularly decussate ovate sessile leaves and terminal corymbs of pink flowers, in regularly-forking cymes, is a common

garden plant which occurs occasionally as an escape, e.g., on the hill side below the church at Kodaikanal.

CERASTIUM.

F.B.I. 18 X.

Chickweed.

Named from the *Greek* KERAS, a horn, because of the comparatively long and curved capsule, its most distinguishing characteristic. Pubescent and sticky weak-stemmed herbs with broad sessile leaves and small white flowers in terminal cymose panicles, and having the sepals free. Not unlike STELLARIA but for the long pod.

Species 100 distributed over the northern temperate regions and on tropical mountains, but absent from Australia (except the common garden Chickweed, *C. vulgatum* L.

Capsule $\frac{1}{4}$ inch, or less; flowers few, the branches of the panicle bifurcating *C. indicum*.

Capsule $\frac{3}{8}$ inch or more; branches of panicle constantly branching into three *C. vulgatum*.

Cerastium indicum *Wight and Arnott; Wight Herb.* No. 1491; *F.B.I.* i 227, X 3. Stems very slender. Leaves lanceolate or elliptic, acute, $1\frac{1}{4}$ by $\frac{3}{8}$ inch, smaller towards the top, and reduced to small scales under the branches of the inflorescence. Flowers few in dichotomous cymes, with widely spreading pedicels. Capsules not much longer than the sepals. t. 25. *Wight* Ill. i 26.

In sholas on the Nilgiri and Pulney hills, but not on the Bombay Ghats. *Fyson* 331, 389. * *Bourne* 231, 756.

Cerastium vulgatum *Linn. var glomerata Thuillier; F.B.I.* i 228, X 4; Common or Mouse-ear Chickweed. A coarsely hairy, more or less sticky herb, typically annual but occasionally perennial, very variable in habit. Ground leaves narrow and stalked, stem leaves sessile,

broadly ovate to narrow oblong. Flowers in almost perfect three-chotomous panicle. Sepals $3/16$ inch with conspicuous scarious margins. Petals shorter, sometimes absent. Stamens often reduced to five or fewer. Capsule projecting far out of the calyx, slightly bent and opening at the top in ten small teeth, very smooth and glistening when ripe. t. 26. *Fyson* 1451.

A garden weed, found now all over the world, wherever it is not too hot. *Fr.* Morgeline, *Ger.* Hornkraut.

STELLARIA.

F.B.I. 18 XI.

Stitchwort, Chickweed.

Flowers similar to CERASTIUM, except that the styles three only or if five then alternate with the sepals, and capsule globose, opening by valves. Herbs with opposite exstipulate leaves, and flowers in cymose panicles.

Species about 100 in temperate regions and tropical mountains, many cosmopolitan. *Ger.* Wasserstern.

Stellaria media *Linn.*; *F.B.I.* i 230, XI 5; Chickweed or Starwort. A common weed with weak stem and small white star-shaped flowers.

Stem weak, much branched, flaccid, green and marked with two opposite lines of fine white hairs. Lower leaves with slender stalks, $1/2$ inch or more, ovate, acute, glabrous, quite entire; upper leaves sessile. Flowers in the axils of the upper leaves, or in irregularly forked leafy cymes. Sepals $1/8$ inch. Petals shorter, deeply cleft into two narrow diverging lobes (star-like). Stamens ten to five. Styles free, capsule ovoid, projecting beyond the sepals, seeds brown, covered with sharp tubercles. *Wight Ic.* t. 947.

In sholas and as a weed. *Fyson* 1860. *Bourne* 468.

Gen. Dist. All through the temperate regions of India and Ceylon and over the arctic and north temperate regions.

ARENARIA.

F.B.I. 18 XIII.

Sandwort.

Like STELLARIA but the petals not divided or notched ; styles not divided ; capsule opening by the same or double the number of valves as styles.

Species 100, almost all over the world, more especially in the temperate and cold regions.

Arenaria neelgherrensis Wight and Arnott ; *Herb. Wight* 148 ! ; *F.B.I.* i 239, XIII 14 ; Nilgiri Sandwort. Stem and its numerous branches slender, with a line of pubescence down one side. Internodes $\frac{1}{4}$ to $\frac{1}{2}$ inch. Leaves $\frac{1}{5}$ to $\frac{1}{3}$ inch, ovate, one-nerved, hardly acute. Flowers on slender pedicels of 1 inch in the axils of the upper leaves or in leafy cymes. Sepals $\frac{1}{8}$ inch long and broad, ovate-acute, with a single hairy nerve and thin scarious edges.

Nilgiris : Ootacamund and Dodabetta (Gough !) and below.

Very close to *A. serpyllifolia* L. of Europe, but in habit much laxer, leaves less acute, inflorescence less distinctly cymose, and sepals with only one nerve and that pubescent. *A. serpyllifolia* L. ; *F.B.I.* i 239, XIII 14 ; may also occur in a lax form as an introduced weed. It has more pointed leaves, more distinct cymes, and the sepals and bracts with three or five veins.

SPERGULA.

F.B.I. 18 XVI.

Spurry.

Annual herbs with narrow leaves and small scarious stipules. Sepals free ; petals entire ; styles five, alternate with the sepals ; capsule opening by five valves opposite the sepals.

Species two or three only in temperate climates ; a weed of cultivation. *Eng.* Spurry. *Fr.* Spergule. *Ger.* Spark, Spergel.

Named from the Latin SPARGERE to scatter,

Spergula arvensis *Linn.*; *F.B.I.* i 243, XVI 1; Corn Spurry. An annual with dense false whorls of long linear leaves at the base of which are small scarious stipules, and small flowers with entire petals. Stems 6 to 12 inches, pubescent or glandular, green, simple or forked. Leaves linear-subulate, half-cylindrical, grooved beneath, in bunches at the nodes because of the development of those of the axillary buds. Stipules small scarious. Flowers in regular three-chotomous cymes, white. Sepals obovate-obtuse. Petals white, shorter than the sepals, not notched. Stamens ten or five. Capsule subglobose, longer than the sepals. Seeds black, slightly flattened and with a narrow scarious border. t. 27.

A weed of cultivated ground on these hills. *Fyson* 1354. *Bourne* 760.

Not recorded in C.B.F. on the ghats to the north, but in Scind and on the Kirthar mountains. *Gen. Dist.* Cosmopolitan in temperate climates.

POLYCARPON.

F.B.I. 18 XVIII.

Diffuse herbs with flat, often falsely whorled, leaves and small flowers in much branched cymose panicles. Bracts scarious; sepals with scarious edges and green keels; petals small hyaline; stamens three to five; style short, three-fid; capsule opening by three valves.

Species about 5, over temperate and tropical regions.

Polycarpon loeflingiæ *Bentham and Hooker f.*; *F.B.I.* i 245, XVIII 1. A perennial with weak angular branches spreading on the ground in a flat circular patch 6 to 12 inches across. Leaves of a whorl unequal, from $\frac{1}{4}$ to $\frac{3}{4}$ inch, obovate-cuneate. Cymes terminal or in the forks dense or not. Flowers $\frac{1}{8}$ inch diameter.

Ootacamund in waste ground. Flowering after the first spring rains. Also all over the plains of this Presidency.

Gen. Dist. Tropics of Asia and Africa,

HYPERICINÆ.

A small family of 8 genera and some 200 species, of which 160 belong to the genus *HYPERICUM* distributed in temperate climates of the northern hemisphere.

HYPERICUM.

F.B.I. 22 II.

St. John's Wort.

This is perhaps the easiest of all genera to recognise for the bright yellow flowers have numerous stiff straight stamens in bunches alternating with the petals, and the leaves contain oilglands which against the light show as translucent dots or streaks.

The only plants which have similar oilglands have either alternate leaves (*RUTACEÆ* and *MYRSINÆ*) or inferior ovaries (*MYRTACEÆ*).

Plants mostly small, either herbs or shrubs, never trees; leaves opposite, sessile, entire. Flowers typically in cymes of three (the middle one opening first and terminating the axis); but also solitary or paniced. Quite regular. Sepals five. Petals five, yellow, overlapping each other in bud and twisted. Stamens numerous, united into one, three, or five, groups, alternating with glands. Ovary a superior with a corresponding number of cells and of styles. Fruit a capsule which splits open into its constituent cells (not down the back of each one as with so many capsules), leaving the placentas attached to the central axis or the edges of the valves.

Species 160, in temperate climates. England has about 10. *St. John's Wort*, or *Tutsan*; *Ger. Johanniskraut*.

Named from the Latin form of an old Greek one, of Dioscorides, of unknown derivation. Suggestions are (i) HUPER under, and EIKON image, because the stamens stand like a figure, in the centre of the flower; (ii) HUPER under and ERIKE heath. "St. John's Wort" perhaps because of the stamens spreading like the golden rays painted behind a Saint's head in old pictures.

- a { Shrubs. Stamens in five groups ; styles five b
 Herbs. Ovary one-celled c
- b { Branches stiff; leaves decussate; styles slender longer
 than the ovary. (Common) *H. mysorens.*
 Branches drooping, the bush round-topped; leaves
 bifarious; styles stout, shorter than the ovary
 (Rare) *H. hookerianum.*
- c { Bracts and sepals fringed with long-stalked glands; seeds
 dotted, but not ribbed *H. wightianum.*
 Bracts and all parts devoid of stalked glands, but
 fringed with small dots just inside the margin; seeds
 ribbed. *H. japonicum.*

Hypericum mysorens *Heyne, Wall. Cat.* 4808!; *F.B.I.* i 253, II 2; common shrubby St. John's Wort. A shrub, 3 to 8 feet high; twigs four-angled, green or reddish. Leaves stiffly decussate, horizontal with tips curved slightly upwards, narrow elliptic lanceolate, sessile, with strong midrib. Flowers at the ends of the branches, solitary or in threes, of a rich yellow colour, 3 to 4 inches across, mostly facing upwards. Sepals lanceolate $\frac{1}{2}$ inch by $\frac{1}{8}$ inch. Petals obovate-oblong, limp and flat when fully out and therefore widely separated, reddish on the back of the parts exposed in bud. Stamens slender and very numerous, in five bundles: anthers globular, $\frac{1}{50}$ inch. Ovary five-celled, with five styles longer than itself. Fruit a rich crimson colour, egg-shaped, pointed; surmounted by the five styles. t. 28. Wight Ic. t. 56.

The commonest species and abundant everywhere on the Nilgiri downs, more especially on soil, as near Kotagiri and Pykara, where it covers whole hill-sides to the exclusion of every other shrub. *Fyson* 3004. *Bourne* 3.

Gen. Dist. On the hills generally of South India and Ceylon, but rare in the Bombay Presidency and not reported from elsewhere in India.

Hypericum hookerianum *Wight and Arnott; Herb. Wight Prop!*; *F.B.I.* i 254, II 6. A round-topped shrub with weak spreading, not erect, branches. Leaves rather flaccid ovate, set bifarious, i.e., in two rows all facing

upwards, not decussate. Flowers pale yellow and saucer-shaped, the petals not separating widely as in *H. mysorensis*. Styles thick shorter than the ovary. t. 29.

The two plants are totally different in habit and general appearance. Wight Ic. t. 949.

Nilgiris : (Wight Herb. Prop. "prope Utacamund"!). Near Pykara (coll. Rangachari !). Pulneys ; Seen by me only in the garden of the Observatory (lower house). *Fyson* 1427, 2072. *Bourne*.

Gen. Dist. Himalayas, Khasia.

Hypericum wightianum Wall. Cat. 4010! ; *F.B.I.* i 256 incl. in *H. nepaulense* ; II 15 *. A weak spreading herb with smooth round stems up to 15 inches long. Leaves ovate $\frac{1}{3}$ to $\frac{3}{4}$ inch, all except the uppermost devoid of stalked glands. Bracts and sepals with slender teeth tipped by black or red glands and with long pellucid veins. Some of the uppermost leaves also with a few gland tipped teeth near the base, but for the most part the leaves entire and with round pellucid dots and also when dried large black dots on the under side. Anthers tipped by round black glands. Styles three, free, about $\frac{1}{8}$ inch, with conspicuous round red stigmas. Ovary one-celled, the seeds attached to the outer wall in three rows, round and dotted, not ribbed. t. 30. Wight Ill. t. 43.

Very common in moist places, both Nilgiris and Pulneys above 5,000 feet. *Fyson* 3005, 2604. *Bourne* 42, 2021. *Wight Herb. Prop.* 336.

H. nepaulense Choisy occurs on the higher slopes of the Himalayas from Sikkim to Cashmere. It has a two-edged stem, short teeth only on the sepals, and a three-celled ovary.

Hypericum japonicum Thunb. ; *F.B.I.* i 256, II 17 ; Marsh St. John's Wort. A very delicate herb, growing, in marshy and damp places, in tufts a few inches high ; stems straight, up to 8 inches ; branches or not, four-angled. Leaves $\frac{1}{2}$ inch or less, oval or ovate, quite entire,

clasping the stem at the base ; midrib strong, veins four from the base, very slender ; glands in the leaf as round pellucid dots. Flowers at the ends of the main stem and its branches, in comparatively large loose cymes ; bracts and sepals quite entire, without any stalked glands. Flower $\frac{1}{4}$ inch diameter pale yellow. Stamens all free, not in bundles. Ovary one-celled, with three parietal placentas and three very short ($\frac{1}{20}$ inch) styles. Capsule $\frac{1}{6}$ inch, red. Seeds flat short oblong, with about seven longitudinal ribs and numerous transverse striations. t. 31.

Very common in moist places or shallow standing water. Nilgiris ; Ootacamund downs and golf links, Pykara. Pulneys : Kodaikanal downs. *Fyson* 1182, 2667. *Bourne* 18.

Gen. Dist. Anamalais, Ganjam, Poonachi hills but on the ghats to the north rare, and recorded in C.B.F. from Castlerock, S. M. country, only. Widely distributed in eastern temperate climates, Himalayas, Khasi hills, Assam, Burma, and on to China, Japan, Australia and New Zealand.

TERNSTRÆMIACEÆ.

Tribes—TERNSTRÆMIACEÆ and GORDONIEÆ.

Woody plants with alternate, thick or hard leaves ; flowers solitary on their stalks ; sepals imbricate, and progressively larger, rather hard and often brown ; petals imbricate and lightly attached to each other at the base ; stamens numerous, sometimes attached to the base of the petals ; ovary three to five-celled, with a single style. Rather characteristic of the family are the hard, comparatively large, buds.

A family of some 240 species, common in the tropics of Asia and America, but very rare in Africa ; absent from Australia, and practically so from all temperate climates.

Economically the most important member is the Tea-plant, *Camellia theifera* *Griff.*, a native of Assam and China. Another species of the same genus, *C. japonica* *L.*, is cultivated in European gardens, for its rose-like but scentless flowers.

Flowers small, not above $\frac{1}{4}$ inch, very numerous on the older and leafless parts of the small branches. . . . EURYA.

Flowers $\frac{3}{4}$ or 1 inch across, few, yellow.

Leaves entire ; seeds with soft warty, red covering ; a large tree. TERNSTRÖEMIA.

Leaves serrate ; seeds winged ; tree. GORDONIA.

TERNSTRÖEMIA.

F.B.I. 24 II.

Evergreen trees or shrubs. Leaves firm and leathery ; entire or serrate. Flowers bisexual. Sepals imbricate. Petals imbricate, connected at the base. Stamens many ; anthers glabrous, fixed firmly on the ends of their filaments. Ovary of two or three cells, each with two pendent seeds, style simple. Fruit indehiscent, seeds few, pendent from the top of each cell. Embryo bent, with very short half-cylindrical cotyledons.

Species 28, mostly in tropical America ; but about six in the warmer parts of Asia and the Indian archipelago.

Named by Linnaeus in honour of a Swede, C. Ternström, who as a naturalist travelled over China in 1745.

Ternstroemia japonica *Thunbergh* ; F.B.I. i 280, II 1. A very fine, shady tree, growing to 40 feet or more, with straight stem and hemispherical crown of foliage ; bark smooth and wrinkled ; branches rather crowded, and swollen at the point of attachment. Leaves crowded near the ends of the branches : stalks $\frac{1}{4}$ inch, red, thick : blades $2\frac{1}{4}$ by $1\frac{1}{4}$, oblong-obovate, entire, thick, glabrous. Flowers hanging from the axils of the fallen leaves and below the green ones, fragrant : stalks 1 inch, very slightly two-edged, erect in bud, afterwards bent down : bracteoles two, close under the sepals and hardly distinguishable from them. Sepals five, imbricate. Petals spreading $\frac{3}{4}$ inch, pale yellow, stiff and easily crushed, connate at the base. Stamens many : anthers opening at the side, and ending in minute points. Ovary two or

three-celled: fruit $\frac{3}{4}$ inch, clasped at the base by the enlarged sepals and the two small bracteoles, and peaked at the top by the persistent style; smooth like an apple, with pericarp $\frac{1}{8}$ inch, thick. Seeds four, hanging from the top of the cells and persistent when the pericarp opens; covered with a scarlet soft and deeply papillate outer skin; inside this stony: endosperm very hard; embryo inside almost S-shaped, the radicle pointing upwards. t. 32. Wight Ic. t. 47. Bedd. Fl. Sylv. t. 91.

In sholas. Nilgiris: Ootacamund (but not common), Pykara, quite common, 6,500 to 7,000 feet. Coonoor. Not found on the Kodaikanal downs. *Fyson* 2613. *Bourne*.

Gen. Dist. Not at all on the ghats to the north (Bombay Presidency); but on the Khasi hills and southwards to Moulmein, and on to Sumatra, China, and Japan. I am unable to distinguish the variety *Wightii* of the F.B.I.

The length of time these highly coloured seeds hang in the opened fruit, while most seeds fall quickly to the ground, is significant, and clearly a very useful adaptation for dispersal by birds, which are attracted by the high colour, are rewarded by a little soft flesh to eat, but are prevented from damaging the embryo by the stony endosperm, and smooth skin. The flowers are adapted for pollen-seeking bees, which are attracted by the scent and the yellow colour.

EURYA.

F.B.I. 24 VI.

Usually shrubs. Flowers unisexual, on separate plants (dioecious); sepals imbricate. Petals imbricate, connected at the base. Stamens many, attached to the base of the corolla; anthers firmly fixed on their filaments; ovary three-celled, with many ovules; styles three; fruit a berry. Seeds many, attached to the middle of the placentas; embryo as in TERNSTRÆMIA.

Species about 50 in Mexico, South America, West Indies, and East Indies.

Named, it is said, from the Greek EURUS broad, because of the broad leaves, but this is hardly applicable to our species.

Eurya japonica Thunbergh, var *nitida*, Korths; L.F.B.I. i 284 VI I. Most often, as at Ootacamund, a shrub barely 10 feet high, but in the sholas of the Pulney downs also as a tall tree, overtopping all others. Its most distinguishing characteristic is the arrangement of the quite small flowers or berries on the lower, and leafless, 3 to 5 inches of short lateral branches which are leafy at the ends. Twigs very slender, much indented by the scars of the fallen leaves, and soon covered with gray or whitish bark. Leaf-stalks $\frac{1}{4}$ inch; blades 1 to 2 inches elliptic or oblanceolate, shortly acuminate, closely serrated except on the lower third, hard and shiny, glabrous. Flowers in little groups of two or three, shortly stalked in the axils of the fallen leaves; less than $\frac{1}{4}$ inch across when fully open. Sepals five, hard and shiny. Petals five, united at the base. Stamens about three times as many. Fruit a black berry, $\frac{1}{5}$ inch diameter with a minute three-fid style in the centre of a depression at the top, and sitting in the remains of the dried sepals. Seeds $\frac{1}{20}$ inch, light brown, flat; embryo inside curved. t. 33.

The F.B.I. gives three varieties, two of them as occurring here. But I have seen only this one. It has smaller leaves than the type.

Very common in sholas on both plateaus.

Gen. Dist. Mountains of India, Ceylon, Burma, and the Malay archipelago to China, Japan, Fiji, etc. *Fyson* 658, 1739, 2069, 2441. *Bourne* 98, 323, 733.*

The species has always been described as being a small shrub, like the cultivated Tea; and that I am told is always its habit in China, etc. But on the Pulneys and also, Mr. Gamble tells me, on the Sikkim hills, it is always much larger than Tea and often a tall tree; and I have on the Pulneys collected from a tree at least 60 feet high (No. 2069). Our plant may therefore be another species but I am unable to indicate any other difference.

GORDONIA.

F.B.I. 24 XII.

Anthers lightly attached to their filaments; fruit a loculicidal capsule; seeds with a wing at the top—
Trees with evergreen entire or crenate leaves and often

beautiful flowers. Sepals unequal, imbricate. Petals only lightly connected, if at all, at the base; the inner larger. Stamens many. Ovary three to five-celled, with many pendent ovules; style simple. Seeds without endosperm; embryo straight.

Species about 16, mostly in India, Malaya, and south China; also in North America.

Named in honour of Gordon, a horticulturist.

Gordonia obtusa Wallich, *Cat.* 14591; *F.B.I.* i 291, XII 2. A moderate sized, evergreen tree, with rather erect and not widely spreading branches, which end in large silky buds. Leaves 2 to 4 inches elliptic, crenate, acute at both ends, firm and smooth; stalk $\frac{1}{3}$ inch; midrib strong. Flowers lateral on the branches, solitary in the leaf-axils, 1 to 2 inches diameter, very handsome, white. Sepals silky on the back; outer smaller. Petals thin, and thinly silky. Stamens numerous, attached to the petals. Ovary five-celled; style single; fruit a five-angled, woody capsule, 1 inch long, furrowed at the top, and opening loculicidally so that the valves (carpels) separate from the persistent axis, to which the ten seeds are attached. Flowers May to December. t. 34. Wight Ill. t. 99.

Fairly common, especially near water.

Nilgiris: Ootacamund, in the swamp below Havelock road; in sholas on the downs; Pykara. Flowers May. Pulneys: on the downs in sholas; Silver cascade. *Fyson* 1788*, 1104, 2714. *Bourne* 116.

Gen. Dist. Permade, Anamalais, Travancore and on the Bombay Ghats to the north, but not elsewhere in India.

MALVACEÆ.

Mallow, Hollyhock, etc.

This family is distinguished from all others chiefly by the very numerous anthers being of one *cell* (two pollen sacs) only instead of two, and attached by short stalks

to a staminal tube which stands up round the style in the centre of the flower.

Well-known members of the family are HIBISCUS Shoe-flower, ALTHÆA Hollyhock, GOSSYPIUM Cotton-plant, ERIODENDRON and BOMBAX Silk-cotton trees, THESPESIA, planted on the Madras beach.

The plants are as a rule more or less covered with both simple and stellate hairs; have a fibrous and slimy inner bark; alternate simple, stipulate leaves; and showy flowers borne solitary in the leaf-axils. The flowers have five petals twisted over each other in bud; numerous stamens united as above mentioned in one tube, or in definite bundles; and a three to five-celled ovary with single branched style and capitate stigmas. The fruit is always dry, either a capsule or breaking up into separate seed-containing sections.

The family is mainly a tropical one, and abundant on the plains, where various species of HIBISCUS are cultivated, either for the fibre of the inner bark (Hemp) or the edible fruit (Bandikai) or as garden flowers. On these hill-tops only two genera appear to be indigenous.

The name MALVA (Eng Mallow, Ger. Malve, Fr. Mauve) was adapted by Linnaeus from the Greek MALAKEE, soft, in allusion to the sliminess of the plant when crushed. HIBISCUS was the Greek name for our Mallow.

- | | | |
|---|---|-----------|
| a | { Tall herb, with lobed or entire leaves | b |
| | { Low creeping herb, with much dissected leaves | MODIOLA. |
| b | { Ripe carpels separating from each other. | MALVA. |
| | { Fruit a pointed, bristly capsule | HIBISCUS. |

MALVA.

F.B.I. 26 III.

Mallow.

Downy herbs with lobed leaves and axillary clusters of flowers, each with three free bracteoles and characterised further by having in each carpel one ascending ovule and by the carpels separating from each other in fruit.

Species under 20, in temperate regions of the Old World some widely distributed as weeds.

Malva verticellata Linn.; *F.B.I.* i 320, III 1; Mallow. Stem branched 2 to 4 feet. Leaf-stalk 2 to 7 inches: blade as long and nearly as broad, with five large lobes, and crenate margin. Flowers nearly sessile in dense clusters at the nodes. Petals notched, slightly longer than the sepals. Carpels ten to twelve, enclosed within the calyx, accrescent netted at the sides, prominently ribbed at the back.

Pulneys: near Gundan shola above Kodaikanal. *Bourne* 1623.

Gen. Dist. Europe to Abyssinia and China. Himalayas. Nilgiris.

MODIOLA.

26 IV.*

Fruit schizocarpic, each carpel with two seeds separated by a horizontal partition; epicalyx of three bracteoles.

One species only, a native of North and South America, but found also in South Africa.

Closely allied to *ABUTILON*, and the fruit in general appearance so like one of that genus that it may easily be mistaken for it; but the carpels in *ABUTILON* are not divided by a horizontal partition.

Modiola caroliniana Linn.; IV * I. A small herb with green prostrate stems and branches matted close to the ground; and covered with numerous large stellate hairs. Leaf-stalks $\frac{1}{2}$ to $1\frac{1}{2}$ inches; blades deeply three-fid, segments again cut in more than one series (very like *Ranunculus diffusus*, DC.), nearly glabrous; stipules $\frac{1}{8}$ inch. Flowers red, solitary in the leaf-axils; stalk jointed one-third from the top hairy like the branches. Epicalyx of three lanceolate, acute, bracteoles. Calyx five-fid, the lobes triangular, acute, three-veined, with simple hairs on thick bases along the veins. Petals pink, $\frac{1}{8}$ inch hardly longer than the sepals. Staminal tube branching at the end only into anther-bearing filaments, and not continued

beyond them : spines of the pollen grains short. Styles many, purple, slightly thickened at the ends. Ovary of many carpels, each containing two seeds, and divided by a horizontal partition between them; hilum of the upper seed below its micropyle, of the lower above it. Fruit $\frac{1}{3}$ inch across, black, very hairy, breaking into its constituent carpels (about twenty): these with two hair-tipped points at the outermost corner and a deep rounded bay in the middle of the inner edge where they are attached to the centre, and opening by a slit at the top. Seeds glabrous. t. 35.

Ootacamund, covering the bank of the stream between the bazaar and the Gymkhana ground. Not found on Pulneys.

Not as far as I know, previously recorded from India.

HIBISCUS.

F.B.I. 26 XII.

Fruit is a capsule of five cells, which open loculicidally (i.e., down their backs, the cells not separating from one another); and below the calyx a whorl of three or more bracteoles (these in our species might be mistaken for sepals)—Herbs or woody plants, their young parts covered usually with stellate or with simple hairs. Staminal column continuing in five-pointed teeth above the insertion of the topmost filaments. Ovary of five cells, each with three, or usually more, ovules. Style divided above into five branches with round velvety stigmas. Seeds kidney-shaped.

Species about 150 nearly all in the tropics. In Europe only two and in England none.

HIBISCOS was the Greek name for the Marsh Mallow, now known as *Althæa officinale*, a near ally of the Hollyhock; and this name is said to have been derived from IBIS the Egyptian goddess.

Hibiscus angulosus Masters, *Wight Herb. No. 2021*; F.B.I. i 341, XII 27; the Hill Mallow. A tall coarse herb, clothed in all the younger parts with long straight hairs which hide the short stellate ones with which the

whole plant is covered. Stipules soon falling; leaf-stalks variable, from $\frac{1}{2}$ to 5 inches; blades 2 to 4 inches across, deeply or shallowly five-lobed, the lobes acute and irregularly toothed. Flower-stalks in the axils of the upper leaves, longer than the petioles; bracteoles three, large and leaf-like, meeting round the base of the flower. Calyx white, thin, in the form of a tube split down one side. Corolla when fully open up to four inches across. Staminal-tube with anthers all the way up. Styler branches five, with round red stigmas. Capsule, 1 to $\frac{1}{2}$ inch, pointed, splitting open in five acute, hairy valves. t. 36. Wight Ic. 951.

By the edges of sholas; flowering in the colder months, September to January. Nilgiris: Ootacamund to Kotagiri and below. Pulneys; on the downs quite common. *Fyson* 2206, 1743. *Bourne* 446, 2489.

Gen. Dist. South India and Ceylon on the higher mountains. Not on the ghats to the North (C.B.F.).

It is perhaps worth noticing that the duty of protecting the petals and inner parts of the flower, ordinarily left to the sepals, is here undertaken by the large bracteoles, and that the calyx has degenerated to a thin tube, while the petals are thickened at the top where they are exposed.

TILIACEÆ.

Of this family, as given in the Gen. Plant., one genus, ELÆOCARPUS, is represented here, with two species. They are trees with simple alternate leaves, and lateral cymes or spikes of perfectly regular flowers, consisting of five sepals valvate in bud, five petals, numerous stamens standing in a raised centre, and an ovary of several (a variable number of) cells topped by a single style and ripening into a fleshy fruit with one or more stones.

In most of the genera the fruit is dry, not fleshy; and the inner bark, like that of the Malvaceæ is fibrous and slimy with mucilage. Because it has not this mucilage and its anthers are very slender and open by gaping at the end and not along lateral slits, ELÆOCARPUS is by some systematists, e.g., Engler und Prantl, separated together with some half dozen other genera into a distinct family.

The family is mainly a tropical one, *TILIA* the lime tree of England, *Fr.* Tilleul, *Ger.* Linden being almost the only genus occurring north or south of the 30° line of latitude. It is also pre-eminently Indian, some of the genera and many of the species being found only in this country.

Economically the most important species is the Jute or Gunny-plant, *CORCHORUS CAPSULARIS*, the fibre of which is obtained from the bark. The Linden, *TILIA EUROPEA*, is also a source of fibre (the *bast* of gardeners), and ropes used to be made of this in various parts of England, and also in olden days a rough kind of paper.

The name TILIA is said to have been derived from the Greek PTILON, a wing because of the long bract attached to the flower-stalk.

ELÆOCARPUS.

F.B.I. 28 XIII.

Flowers in axillary spreading racemes, facing downwards; petals conspicuously fringed; anthers long, opening at the top; fruit 1 inch or more . . . Mock-olive.

Species about 50, mostly in or near India, a few only in Australia, New Zealand and the Pacific.

Named from the Greek ELAIS oil and CARPON fruit.

A round-topped tree; leaves flat, oval, turning bright crimson. Frequently planted in the open near villages . . . The Nilgiri Mock-olive *E. oblongus*.

A flat topped tree, foliages in tiers; leaves round backed, like an inverted boat, and rusty; anthers with a long projection. .

A shola tree *E. ferrugineus*.

Elæocarpus oblongus *Gærtner*; *F.B.I.* i 403, XIII 13; the Nilgiri Mock-olive. Stem white, well branched, with domed foliage; twigs with conspicuous lenticels, as yellowish pustules. Leaves elliptic, acute or acuminate, glabrous and shining above, crenate-serrate with glad-tipped teeth almost or quite to the acute base; petiole also with two minute glands near the top. Racemes 2 to 6 inches long, in the axils of the fallen leaves, slender; bracts minute; pedicels $\frac{1}{3}$ to $\frac{1}{2}$ inch; buds ovate-acute. Sepals $\frac{1}{6}$ inch, acute, finely pubescent. Petals $\frac{1}{5}$ inch wedge-shaped, with cuts extending from the end half-way down. Stamens on a

raised torus $\frac{1}{20}$ inch high, very numerous; anthers $\frac{1}{8}$ inch gaping at the end not produced beyond. Ovary $\frac{1}{20}$ inch covered with short erect hairs; style twice as long, tapering to a point. Fruit an Olive-like drupe, 1 by $\frac{1}{2}$ inch. t. 37. Wight Ic. t. 46.

In the axils of the main veins, on the under side of the leaves, one nearly always finds small perforated swellings. These though probably the result of insect agency occur too consistently to be left out of a description. The crimson colouring of the autumn foliage is very striking; one nearly always finds a few leaves turned, and a tree may be identified by them. When a whole tree is crimson the effect is comparable to that of the "Virginia-creeper."

Quite common towards the lower limit of our areas, often planted near villages. *Fyson* 649, 1721, 2674, 2771. *Bourne* 219, 801.

Distributed to the north in the evergreen forests of Canara, and Mableswhar; westwards to Burma and the Malay islands, but not on the intervening plains. Confined to the semi-temperate hill-tracts of the tropics of Asia.

***Elæocarpus ferrugineus* Wight, *Herb. Prop!*; *F.B.I.* i 406, XIII 27;** a shola tree with greyish green foliage in well-marked tiers, easily recognisable at a distance and more closely by its absolutely characteristic round-backed leaves. All young parts and leaves covered with a dense, rusty or greyish, tomentum of short stellate hairs; leaf-scars flat; lenticels small; petiole 1 inch. Leaf very convex, like an inverted boat without its keel, elliptic, shortly acuminate, with very shallow serrations $\frac{1}{16}$ to $\frac{1}{8}$ inch apart and tipped with short hairs; densely tomentose on the lower side, less so on the upper and eventually smooth; veins about nine pairs, very regular and repeatedly bifurcating towards the margin. Racemes 2 to 4 inches, pedicels $\frac{3}{4}$ inch; buds elliptic, $\frac{1}{3}$ inch. Sepals $\frac{1}{2}$ by $\frac{1}{6}$ inch, all densely tomentose. Petals as long, $\frac{1}{8}$ inch wide, covered with long appressed hairs, cut from the margin about one-third down. Stamens twenty or so, on a low yellow torus; anthers $\frac{1}{6}$ inch, one lobe prolonged at the end into a slender curved awn, the other much shorter. Ovary densely covered with hairs, three-celled; style

slender, $1/5$ inch. Fruit oval $3/4$ by $1/5$ inch, fleshy, green, with one stone containing a cell with one matured seed and dried up undeveloped ovules, and two other squashed and aborted cells. Endosperm thick, horny, smelling and tasting strongly of cocoa. t. 38. Wight Ic. t. 205 (Monocera). Bedd. Fl. Sylv. t. 112.

The leaves turn red, but fall very soon after, so that this colouring is not conspicuous as with *E. oblongus*.

In sholas only, very common at high levels, especially on the Pulney downs, where there is hardly a shola without several trees. Nilgiris on Dodabetta. *Fyson* 343, 1125, 2205. *Bourne* 799, 2032.

Not on lower levels and absent entirely from the Bombay Ghats to the north. Apparently confined to these South Indian hill-tops.

LINACEÆ.

Tribe I.

Small herbs or shrubs with alternate simple leaves, and racemes of regular and symmetrical flowers on the four or five plan. Petals twisted in bud, soon falling. Stamens as many. Carpels dehiscent septically.

LINUM.

F.B.I. 29 I.

Flax, etc.

Flowers usually blue, the parts in fives. Sepals entire. Fertile stamens five, alternate with the petals, attached to each other at the base; staminodes very small; glands five, attached to the outside of the staminal tube and opposite the petals. Capsule breaking into five two-seeded or ten one-seeded parts. Seeds oily. Leaves quite entire, narrow.

Species about 90, mostly round the Mediterranean.

Named from LINUM, Latin for thread cotton or flax. The root LIN is one of the oldest root words known.

Flax the fibre which is spun and woven into linen is obtained from the outer part of the stems of one species

***Linum mysorense* Heyne; Wall. Cat. 15071; F.B.I. i 411, II 4.** An annual herb with slender stem 3 to 16 inches high, unbranched till near the flowering region, where it forms broad corymbs; stem glabrous, striate, $1/16$ inch or less in thickness. Leaves sessile, narrow-elliptic or oblanceolate, entire, three-nerved from the base. Branches of the corymb very slender; flowers opposite the leaf-like green bracts. Sepals five, imbricate, each with two slender lateral, and a much stronger middle vein branching reticulately towards the thicker tip; outermost sepal herbaceous with narrow scarious margin, entire; inner very thin, its scarious margin distinctly and regularly cut in minute oblong teeth.* Petals yellow, twice as long as the sepals, rounded. Anthers broadly oval. Styles connate below; stigmas small, capitate. Capsule opening in ten valves. Seeds oval, flat, $1/20$ by $1/30$ inch. t. 39.

Nilgiris: Lovedale. *Fyson* 1218, 1449. *Bourne* 1056.

Gen. Dist. Western Ghats, Himalayas, Ceylon.

F.B.I. and C.B.F. give sepals of genus as entire. The teeth are very small, but are visible in the type plant Wall. 1507!

GERANIACEÆ.

This family as defined in the Gen. Plant. and F.B.I. (i 426), comprises, in India, three tribes: the GERANI-EÆ (Crane's-bill), the OXALIDEÆ (Wood-sorrel), and the BALSAMINEÆ (Touch-me-not). These tribes are by some systematists considered distinct families, and are for convenience treated separately here.

GERANIEÆ.

The most distinguishing characteristic of this tribe is the stout beak (Crane's-bill) which forms in the centre of the flower as the seeds ripen and from which the carpels split off, each with a slender beak that by a quick curling upwards jerks the solitary seed out (Crane's-bill), or

by its hygroscopic twistings and untwistings buries it and its seed in the ground (Stork's- or Heron's-bill). The parts of the flower are in perfect systems of five: five sepals, five petals twisted in bud, with small round glands between them, ten or fifteen stamens, and five carpels in the ovary. They are usually showy.

The tribe occurs in all parts of the world, but not on the plains of South India; and is represented here by only one truly wild species, *Geranium nepalense* Sw., but an *Erodium* and a strongly scented *Pelargonium*, a native of South Africa, occur as garden-escapes.

- | | | | |
|---|---|---|--------------|
| a | { | Leaves palmately cut or lobed | b |
| | { | Leaves pinnate | ERODIUM. |
| | { | Flowers solitary or in pairs, on slender pedicels | GERANIUM. |
| b | { | Flowers in umbels, flower-stalk with a slight swelling on | |
|  | \| | one side near the base | PELARGONIUM. |

GERANIUM.

F.B.I. 32 III.

Crane's-bill.

Stamens ten, all fertile; glands five, between the petals; beak of carpel glabrous; seed one to each ripe carpel, jerked out of it by the curling of the "beak." Herbs with opposite or alternate stipulate, toothed or palmately cut, leaves, at swollen nodes; and flowers solitary or in pairs on axillary peduncles.

Species 260 in temperate climates. *Ger.* Storkhschnabel
Fr. Bec-de-grue.

Named from the Greek GERANOS, a Crane, in allusion to the beak of the ripe fruit.

Geranium nepalense Sweet; *F.B.I.* i 430, III 9; Nepal Crane's-bill. A delicate perennial herb with pink stem and flowers. Rootstock stout; stems slender, weak, much branched, hairy. Leaves opposite, stalks slender, $1\frac{1}{2}$ to 3 inches, densely hairy near the top; stipules $\frac{1}{6}$ inch, very acute; blade deeply divided into five lobes, which are again cut and lobed, the ultimate lobes oblong

mucronate; surface thinly hairy above, below much more so, and whitish; margin often red. Flowers in pairs or solitary on slender peduncles. Sepals $\frac{1}{4}$ inch, with three coarsely hairy nerves, strongly mucronate. Petals $\frac{3}{8}$ inch, pink or mauve. Carpels hairy; seeds smooth, shining. Wight Ill. i. t. 59.

Fairly common near sholas on high elevations, but not lower down or on the ghats to the north. *Fyson* 360, 689. *Bourne* 14, 112.

Gen. Dist. Kashmir, Himalayas 3 to 10,000 feet, and Khasia hills, and on the higher peaks of Ceylon, Indo-China.

ERODIUM.

F.B.I. 32 IV.

Stork's-bill or Heron's-bill.

Stamens five, fertile opposite the sepals and five-sterile between them; glands five; beak of ovary glabrous; seed remaining in the carpel and buried by the twisting of the beak.

Species 60, mostly round the Mediterranean, a few also in the South Africa, temperate America, and south-west Australia.

Named from the Greek ERODIOS, a Heron, to distinguish from GERANIUM with which the species used to be linked.

Erodium moschatum L'Heritier; IV 6. Branches stout; leaves alternate or opposite, pinnate; stipules large, $\frac{1}{4}$ inch scarious, those of the unopened leaves as bud-scales; leaflets obliquely ovate, sharply toothed. Flowers umbelled on long peduncles; bracts like the stipules; pedicels $\frac{1}{2}$ inch. Sepals $\frac{1}{5}$ to $\frac{1}{2}$ inch, five-ribbed, pubescent. Tails of carpels 1 to 2 inches, with a few long, yellow permanent bristles below, and many much shorter hairs above, not woolly; when dry much twisted. t. 40.

A road-side plant of the Mediterranean region, and spread from it over northern Europe, the Cape, North and South America, and Australia. This appears to be the first record of it on these hills; probably a garden-escape. *Fyson* 2029.

PELARGONIUM.

32 IV.

Garden Geranium.

Stamens two to seven only fertile, the rest sterile; flower-stalk with a long tubular cavity inside, ending in a slight enlargement near the base (really the spur of one of the sepals fused to the pedicel); no glands; seed remaining inside the carpel as in *ERODIUM*.

Species 230, practically all in South Africa, six only outside (Australia, Asia Minor, Abyssinia).

Named from the Greek PELARGOS, a Stork.

Pelargonium graveolens Ait.; IV * I. Whole plant strongly scented. Leaves broadly ovate or triangular, 2 by 2 inches, cut deeply into three main lobes and these again deeply cut, or palmately five to seven-lobed or nearly partite; the lobes flat, deeply sinuate-pinnatifid; both sides pubescent. Flowers in umbels on pedicels of 0 to 1 inch, peduncled in the upper leaf-axils; pink.

Native of South Africa. Cultivated in English gardens, and here a garden-escape.

OXALIDEÆ.

As in the Geraniæ the flowers are on a very regular five plan, and the petals are twisted in bud; but the fruit is a capsule, not separating into one-seeded parts but opening down the backs of the carpels; the leaves are compound, and there are no glands between the petals.

Leaflets three or four, attached together to the end of the petiole. (Wood-sorrel, "Capebulb," etc.) . . . OXALIS.

Leaflets many, pinnately arranged . . . BIOPHYTUM.

OXALIS.

F.B.I. 32 V.

Wood-sorrel.

Herbs, some bulbous, with acid-tasting three or four foliate leaves, and umbels of flowers on long petioles; fruit a narrow capsule which splits open in five lines, the

side curling back but remaining attached to the central axis.

About 300 species, chiefly in South Africa, but also in tropical South America. A few in Europe, Asia, tropical Africa and North America. Several have been introduced as garden plants, and because of the difficulty of eradicating the bulbs some have become very troublesome weeds.

The name is an old Greek one, from OXUS, sharp, and ALS, salt, in allusion to the taste of the leaves.

The leaflets fold inwards and downwards at night, showing as marked a sleep-movement as occurs in the family LEGUMINOSÆ. Charles Darwin found that if such movement was prevented the leaves suffered (perhaps from excessive radiation of heat to the sky, i.e., from cold), and thus demonstrated the usefulness, to the plant, of this habit. The stamens and styles are often of three different lengths, some plants of a species having short styles and five medium and five long stamens, others with medium styles and short and long stamens, others with long styles and short and medium stamens. Charles Darwin showed by experiment that this was connected with the cross-fertilization of the seeds by insects, pollen from long anthers producing on the long styled ovaries (necessarily of different plants) better results than on short styled flowers (possibly on the same plant).

- a { No stem above ground, leaves and flower-stalks from a bulb d
- { Stem above ground bearing leaves and flowers, creeping and erect b
- b { Flowers solitary 1 to 1¼ inches red; leaflets ½ to 1 inch; bulb or tuber dark and leathery. *O. variabilis* var. *rubra*.
- { Flowers solitary yellow, or in few flowered simple or compound umbels. c
- c { Leaflets ¼ to ½ inch green; flowers ½ inch pale yellow; stem creeping slender, yellowish . . . *O. corniculata*.
- { Leaflets ½ to 1 inch blotched with dark markings; stem purplish creeping and erect *O. pubescens*.
- d { Leaflets four with dark markings; bulb ½ to 1 inch . . . *O. tetraphylla*.
- { Leaflets three, green; bulb ¼ inch . . . *O. latifolia*.
- { Leaflets three, spotted red; flowers yellow . . . *O. pes-capræ*.

Oxalis corniculata Linn. ; *F.B.I.* i 436, V I; Yellow Wood-sorrel. A small herb with slender stems running horizontally on the ground. Leaf-stalks 1 to 3 inches slender; stipules pale and hairy, adnate to them; leaflets three, obcordate. Peduncles slender, ending in a single flower, or an umbel; pedicels ¾ inch in the axils of linear

$\frac{1}{8}$ inch long, bracts. Flowers pale yellow, $\frac{1}{4}$ to $\frac{1}{2}$ inch across; petals obovate or notched; fruit 1 by $\frac{1}{8}$ inch, tapering and contracted suddenly at the top, many seeded. Seeds flesh coloured, transversely ribbed. t. 41.

A common weed in grass occurring at all elevations upwards from sea level. Distributed all over the world. *Fyson* 184, 2634. *Bourne* 804. *Ger.* Sauerklee, *Fr.* Oseille sauvage.

Oxalis pubescens *H. B. & K.*; V 4. Roots fibrous without bulb; stem creeping or erect, elongated, leafy. Stipules hairy. Leaf-stalks $1\frac{1}{2}$ to $2\frac{1}{2}$ inches, hairy upwards; leaflets three, $\frac{1}{2}$ to 1 by $\frac{1}{2}$ to $\frac{2}{3}$ inch, obovate or obcordate, with dark markings and a few scattered hairs. Flowers in broad irregular compound umbels on axillary peduncles longer than the leaves and up to 5 inches. Sepals pubescent or hairy inside. Fruit cylindrical, narrowed upwards, torrate by the bulging of the seeds; like that of *O. corniculata*. t. 42.

Ootacamund on the Snowdon road, as a garden-escape.

Very similar to *O. corniculata* in habit but larger and quite distinct in the dark markings on the leaves.

Oxalis variabilis *Lindl.*, var *rubra*; V 5; distinguished from all our other species by the flowers, large and solitary, not umbelled, on short peduncles; and the leaflets rounded or obtuse not emarginate. Bulb dark, 1 to 2 inches, smooth. Leaves all radical; stalk 1 to 2 inches densely pubescent; leaflets pubescent all over or on the margins, gland dotted, broadly rhomboid with outer margin rounded not emarginate; middle leaflet cuneate. Flower-stalks equal to or shorter than the leaves, one-flowered. Sepals $\frac{1}{8}$ inch, pilose and ciliate. Corolla tube wide. Petals $1\frac{1}{4}$ inches, red; claw shorter than the limb. Inner stamens toothed. t. 43.

Ootacamund by road-sides and in waste places. A native of South Africa, introduced no doubt as a garden plant.

***Oxalis tetraphylla* Cav.**; V 6; remarkable for the leaflets being usually four, and marked with a broad V of darker colour. Bulb very scaly, 1 to 1½ inches. Leaf-stalk 8 inches, leaflets four, triangular marked by V-shaped band of darker colour a little below the middle. Peduncles longer, flowers umbelled on pedicels of 1 inch. Sepals ¼ inch. Petals ⅝ inch. t. 44.

A native of tropical America, introduced as a garden plant and spreading rapidly by its bulbs, now in many places, especially Kotagiri and lower levels (Yercaud on the Shevaroy), a troublesome weed.

***Oxalis latifolia* H. B. & K.**; V 7. Bulb ¼ inch, of fibrous scales. Leaf-stalks 5 to 8 inches; leaflets three, 1 by 1¼ inches, triangular, broader than long, with a broad apical series. Peduncles 5 to 10 inches, flowers umbelled; pedicels ¼ inch, slender. Sepals ⅓ inch acute. Petals ½ inch, blue, purple or purple-violet, with greenish base. t. 45.

Native of tropical South America, in some places a troublesome weed.

In the figure: *a.* staminal column; *b.* projection at base of the filaments of the long stamens and attached thereto; *c.* styles protruding between the filaments. [*E.T.B.*]

***Oxalis pes-capræ* Linn.**; V 8. Leaves all from the bulbous rootstock; leaflets three, obcordate or deeply two-lobed, glabrous, spotted red or brown. Flowers yellow, an inch or more across, facing upwards; petals rounded: buds pendulous. t. 46.

A native of the Cape of Good Hope, introduced into England in 1757. *Centis Bot. May.* t. 237.

BIOPHYTUM.

F.B.I. 32 VI.

Capsule splitting down the backs of the carpels, and also down the partitions into five boat-shaped valves which spread out flat with the seeds on the placentas (normal loculicidal dehiscence) herbs. Leaves

evenpinnate, crowded or whorled at the top of the stem, which may be branched; stalks swollen at the base. Flowers umbelled on terminal peduncles, small, yellow. Stamens ten, all fertile; five long, five short. (Cf. OXALIS.) Stigmas notched or two-fid. Capsule ovoid opening as above.

Species 20, tropical in Asia, America and Africa.

Named from the Greek BIOS, life, and PHYLON, leaf, because the leaves are very sensitive.

Biophytum intermedium Wight; *F.B.I.* i 438, VI 7; a small woody plant, an annual or with thick rootstock and branching stems which end in flat whorls of pinnate leaves and umbels of small flowers on slender peduncles.

Branches slender clothed above with fine deflexed hairs, and enlarged at the insertion of the leaves. Leaves all terminal, 2 to 3 inches long, oblanceolate, the terminal leaflet being shorter than the middle ones. Leaflets twenty to thirty pairs, sensitive, thin, oblong-oblique with midrib mucronate near the forward angle, more or less hairy on both sides; lateral veins numerous and close set. Peduncles slender, very pubescent, swollen at the top; pedicels umbelled, $\frac{1}{8}$ to $\frac{1}{4}$ inch, pilose. Calyx campanulate, $\frac{3}{16}$ inch; sepals free, narrow, acute. Petals yellow, not spreading widely. Stamens of two lengths, the outer five half the length of the inner: anthers dorsifixed: filaments broadening slightly towards the base. Styles as long again (three times the length of the shorter stamens) clothed with short erect hairs: stigmas capitate. Capsule $\frac{1}{8}$ inch, membranous, hairy, enclosed in the sepals and ending in the equally long persistent styles. Seeds one or two in a cell, oval, shining, with two or three spiral rows of minute red warts, and down the whole length of the ventral side a broad red scar. *Fyson* 332, 1880. *Bourne* 680, 1057, 1056.*

Pulneys : Glen falls near Kodaikanal. Not collected on the Nilgiris and recorded from nowhere else in India, only Ceylon.

The plant flowers apparently its first season, and is to be found therefore as an annual, with slender but woody forked stems and no rootstock. Ceylon specimens (the type in F.B.I.) have thick rootstock ; and in F.B.I. this Pulney plant is separated, as var *pulneyense*, because of this difference of habit. It is also a stronger growing plant than the Kandy one. Our plant is however to be found also with perennial rootstock and woody stem ; so the distinction may not hold good.

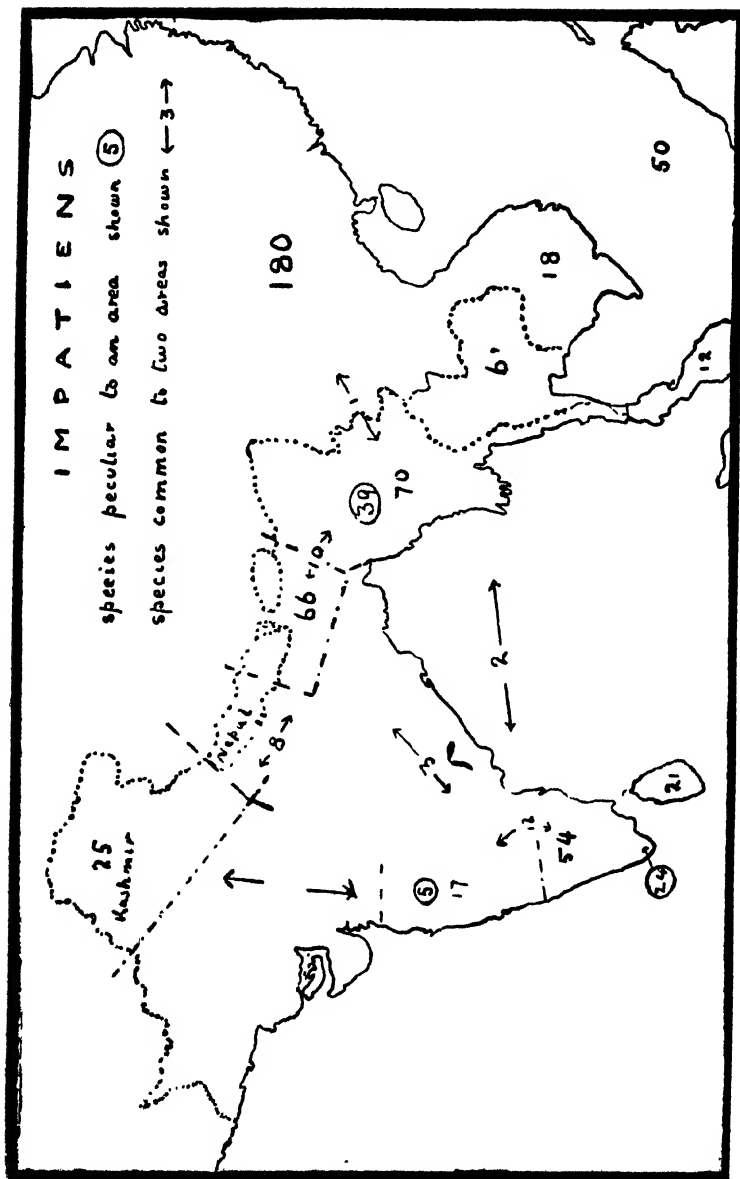
BALSAMINEÆ.

IMPATIENS.

F.B.I. 32 VIII.

Balsam.

The Balsams are easily recognised, but the flower may need some explanation. There are three sepals, only very occasionally five, and of these two are green and very small, while one is coloured like the petals and almost indistinguishable from them. This large sepal is usually prolonged downwards as a sac or spur, and fits closely in front and underneath, with the spur pointing forwards. There are apparently also only three petals ; one, on exactly the opposite side of the flower to the spurred sepal, is outside the others in bud and is usually called the *standard* ; each of the other two has a slit dividing it into two lobes, and is in reality made up of two petals more or less fused together. These wings, as they are usually called, hang down or project horizontally in front over the lip of the spurred sepal, and in some species, the "Orchid Balsams" look very like the labellum of an orchid. In the centre of the flower are five stamens packed tightly round the ovary, their anthers joined together and showing their nature only in the five narrow slits from which pollen oozes out. The ovary has five cells with very thin partition walls and a number of ovules. In fruit it becomes a long and narrow, or a comparatively short and fat, barrel-shaped pod, the sides of which have a tendency to curl up inwards, and



do so when ripe so violently that the seeds are ejected some considerable distance. It is to this explosiveness of the capsule that the genus *IMPATIENS* owes its name.

The flower is therefore on the 5, 5, 5, 5, plan, except that two of the sepals are usually absent; and its peculiar appearance is due to the differences of size of the sepals and petals, and the fusion of the lateral pairs of petals to form the wings. A spurred sepal occurs also in *TROPÆOLUM*, the common garden Nasturtium; and also in *PELARGONIUM*, the garden Geranium, where however it is fused to the flower-stalk and so invisible. Both these genera are included in the family *GERANIACEÆ* of the Gen. Plant. The stem is usually smooth, more or less translucent, and conspicuously swollen at the nodes; and the leaves are always crenate or serrate, with rounded teeth ending in sharp points which at the base of the leaf, where there are hardly crenations, appear as glandlike hairs perhaps 1/16 inch long.

The genus *IMPATIENS*, the true Balsams, is one of the largest among flowering plants, there being over 400 species described, and is found chiefly on the mountains of tropical Africa and south-east Asia (India, China, and Malaya). North America has two species only, Europe one, Siberia two, Japan four,—these are all closely allied; while in tropical Africa there are nearly fifty species, in India about two hundred and in China about as many. But there are none at all in Australia, New Zealand, Polynesia, or the whole continent of South America, so that this is essentially a genus of the Old World tropics, with Borneo and the Philippines as the eastern limit. In India itself, the distribution is remarkably local. There are six well-defined regions, shown on the accompanying map of this country, and of the two main series into which the species naturally fall (130 with short swollen spindle-shaped pods, and 60 with long and narrow or club-shaped ones) one only of the first occurs in the north-western Himalayas, and of the second not one in South India, Ceylon or the Malay Peninsula. The Western Ghats are peculiarly rich in species, especially Travancore, and out of the 54 species described from the Nilgiris and the mountains to the south, 24 are peculiar to the Pulneys and Travancore. Most of these grow however at lower elevations than ours.

The narrowness of the distribution of each series, and of most of the species, seems to point to their having arisen in their separate areas after the conditions, whether of climate or some other factor which had allowed of free intercourse between the areas had passed away and left parts of the genus marooned, so to speak, on the higher hills: for the hot plains between are barriers for such a delicate plant, as impossible of crossing as are the seas to most animals. A similar confinement of species to small areas was found by Charles Darwin in the flora of the Galapagos islands,

off the coast of South America, by Bates in the butterflies of districts separated by the tributaries of the Amazon, and perhaps most remarkable of all, in the snails that inhabit the deep valleys of Hawaii. It was a strong argument in favour of the theory that species are not immutable and that new ones may arise in isolated areas when there is no general mixing with the main stock to prevent divergence.

In the following key the name and numbers of the sections (§ 1. *Scapigeræ*, etc.), are taken from Sir Joseph Hooker's "Epitome of the Indian species of *Impatiens*" published 1904—1906.

KEY TO THE SPECIES.

- a { No ordinary leafy stem above ground, the leaves all from the rootstock; flowers racemed on slender leafless stems, and in general appearance like an Orchid "Orchid Balsams" b
- Stem above ground leafy c
- b { § 1. *Scapigeræ*—'Orchid Balsams.' The wing petals are each cut into oblong lobes and together remind one of the labellum of an Orchid.
- Flowers white, 1 inch across; spur $\frac{1}{2}$ inch incurved, tip inflated p. 63. *I. clavicornu*.
- Flowers mauve pink, $\frac{1}{2}$ to $\frac{3}{4}$ inch across; spur one-fifth inch, straight. p. 64. *I. modesta* Wight.
- c { Flowers on slender axillary pedicels; sepals small or narrow d
- Flowers mostly in umbels or very contracted racemes on axillary peduncles; sepals as long as the rest of the bud and nearly as broad i
- Flowers in racemes, scarlet; sepals almost circular; lip horn-shaped with no distinction of blade and spur . . . (§ 7. *Racemosæ*) p. 70. *I. phœnicea*.
- d { Annual herbs with all the leaves opposite e
- Well branched bush or shrub; leaves mostly alternate, but often also in unequal pairs or threes h
- e { § 3. *Flowers on axillary pedicels. Annual herbs; leaves all opposite.*
- Flowers $\frac{3}{4}$ inch stiff, or more; spur slender, much longer than the wings; stem stiff nearly always unbranched; fruiting pedicels stiffly deflexed; leaves serrate . . . 3. p. 64. *I. chinensis*.
- Flower $\frac{1}{2}$ inch or less; spur shorter than the wings, often a mere sac f
- f { Stem up to 18 inches high, not much if, at all branched, flowers red or rose g
- Stem 4 to 7 inches flaccid; flowers $\frac{1}{4}$ inch; lip hardly even saccate 4. p. 65. *I. inconspicua*.

- g { Lip with a deep sac and at the bottom of it a small horizontal spur; stems red, more or less pubescent; flower red; leaves oblong . . . *p.* 66. *I. tomentosa*.
 Lip with a broad sac and no spur; flowers rose pink; leaves ovate *p.* 65. *I. rufescens*.
 h { § 4. *Leaves alternate or opposite; bush or shrubby plant.*
 Leaf-blades 2 to 4 inches long; petioles $\frac{1}{2}$ to 3 inches. *p.* 68. *I. latifolia*.
 Leaves smaller, more crowded, spreading and recurved. *p.* 67. *I. leschenaultii*.
 i { § 6. *Flowers umbelled.*
 Stem unbranched, stout; flowers white, bonnet-shaped, with very short spur. . . . *p.* 69. 10. *I. campanulata*.
 Small well branched herbs, 8 inches or less; flowers $\frac{1}{3}$ inch, pink; spur short but curved, acute. . *p.* 69. *I. goughii*.

Impatiens clavicornu Turczaninow [*Bull. Soc. Nat. Mosc. xxxii* (1859), *p.* 271]; *F.B.I.* (as *I. Beddomei Hooker f.*), i 442, VIII 1; White Orchid Balsam. A small plant with tuberous rootstock $\frac{1}{2}$ inch thick and slender flowering stem, perfectly glabrous. Leaves all from the rootstock; stalk 2 to 5 inches; blade circular-reniform-acute, or cordate, entire or with shallow crenations ending in short red points, fleshy; nerves mostly from the base, arching forwards. Scape up to 12 inches high and $\frac{1}{6}$ or more thick at the base, white blotched with red; bracts $\frac{1}{4}$ inch, edged with red; pedicels slender, 1 inch, similarly coloured. Flowers mainly white; wings $\frac{3}{4}$ by $\frac{1}{2}$ inch, cut into three oblong lobes, tinged with yellow at the base; spur shorter, curved forwards, yellowish with touches of red; standard $\frac{1}{4}$ inch, hood-shaped, and arching over and concealing the anthers and style, reddish on the back. Capsule $\frac{1}{3}$ inch, elliptic; seeds granulate. t. 47. Wight Ic. 967.

In swampy ground (and also on Church Hill; Ootacamund where it was planted!), flowering plentifully in July and August after the rains. *Bourne* 4605, 5990. Not collected on Pulneys.

Gen. Dist. All along the Western Ghats above 6,000 feet.

Wight's sheet (*I. scapiflora*) at Kew, bears the name *I. clavicornu* Turc. in Sir Joseph Hooker's handwriting. He had clearly discovered Turczaninow's description and naming after writing the Flora of British India, and after also writing the Epitome of the Indian species of *Impatiens* in 1906 where the name *Beddomei* is retained. The name *I. Beddomei* published in 1875, is therefore reduced in favour of Turczaninow's earlier one. Colonel Beddome in honour of whom Hooker named the plant was one of the greatest of South India's botanists.

***Impatiens modesta* Wight, Herb. Prop!; F.B.I. i 442, VIII 2; Sweet Seventeen.** In habit very similar to the last, but with slenderer stem. Leaves up to 3 by 2 inches, ovate-or-oblong-cordate, acute or obtuse, coarsely crenate, with a few hairs scattered over the surface and margin. Scape 3 to 6 inches tinged with red; bracts $\frac{1}{8}$ inch; pedicels $\frac{1}{2}$ to $\frac{3}{4}$ inch, very slender. Flowers mauve-pink, up to $\frac{3}{4}$ inch diameter, much as in *I. clavicornu*, but the spur $\frac{1}{5}$ inch only, and curved backwards; wings spotted near the base. Capsule $\frac{1}{6}$ to $\frac{1}{4}$ inch, acute at both ends. t. 48. Wight Ic. t. 968.

Nilgiris: near Pykara, at the lower limits of our area. Bourne 4646. Not collected on the Pulneys.

Not recorded northwards in the Bombay Ghats (C.B.F.)

In the figure: *a*, fruit natural size; *b*, same burst; *c*, the contents—a median placenta with numerous seeds attached; many have dropped off and show their attachments; *d*, enlarged seed showing hairs. [*E.T.B.*]

***Impatiens chinensis* Linn.; F.B.I. i 444, VIII 10; Chinese Balsam.** Stem unbranched 4 to 20 inches high, from a thickened, rooting, prostrate base; glabrous. Leaves all opposite, very shortly stalked, 1 to 4 inches long and a sixth to a quarter as broad, ovate, acute, oblong or lanceolate, not narrowed to the base, sharply serrate; lower side silvery-gray; nerves three pairs, not hairy; stipules linear, $\frac{1}{8}$ inch. Pedicels solitary or in fascicles, slender, $1\frac{1}{2}$ to $2\frac{1}{2}$ inches, deflexed usually in fruit, but sometimes not. Flowers mauve-pink or white, $1\frac{1}{4}$ inches across; spur 2 inches slender, curving forwards; lateral sepals $\frac{1}{3}$ by $\frac{1}{6}$ inch; wings with one large

lobe slightly indented on the inside, and one much smaller one on the outside (usually covered). Capsule $\frac{1}{2}$ to $\frac{3}{4}$ inch: seeds black and shining. The stiffly deflexed fruiting pedicels are very characteristic. t. 49. Wight Ic. t. 748.

One of the commonest species here wherever the ground is a little moist; very variable in size. *Fyson* 422, 543, 323, 2204. *Bourne* 87, 5232.

Gen. Dist. Throughout the Western Ghats down to 3,000 feet in Mysore, Assam, Bhotan, Khasia, and westwards to Burma and China. For a Balsam the distribution is unusually wide.

***Impatiens inconspicua* Benth.** *F.B.I.* i 447, VIII 18; a small plant 4 to 7 inches high, with numerous branches, the lowest almost as long as the stem rather thick and flaccid, glabrous. Leaves all opposite, from $\frac{1}{2}$ by $\frac{1}{5}$ to $1\frac{1}{4}$ by $\frac{1}{2}$ inch, elliptic, acute at both ends, with a few (six or fewer) bristle-like teeth on each margin, whitish below, occasionally pubescent above; veins inconspicuous. Pedicels solitary or in pairs, hair-like, $\frac{1}{4}$ to $\frac{1}{5}$ inch, with a line of red pubescence, deflexed in fruit. Flowers $\frac{1}{4}$ to $\frac{1}{2}$ inch: lateral sepals linear-lanceolate, nearly as long: lip without spur, hardly even saccate: wing with large round terminal lobe and small linear lateral one near the narrow base, purplish with white ends. Capsule $\frac{3}{8}$ inch with about five globose, black, shining seeds $\frac{1}{16}$ inch diameter. t. 50. Wight Ic. t. 970.

Nilgiris: Dodabetta, flowering September (*Bourne* 5248). Not collected on Pulneys.

Gen. Dist. Mountains of the Western Peninsula, 3 to 8,000 feet.

***Impatiens rufescens* Benth.** *Wall. Cat.* 4747!; VIII 23; Pink Marsh Balsam. Stems numerous, weak and decumbent at the base, and rooting at the much swollen nodes, rising up in clumps; pinkish, very hairy (for a Balsam) and flaccid. Leaves all opposite, thick, white

below, with short silvery hairs on the upper side; faintly serrate, the teeth hardly more than mere points $\frac{1}{6}$ to $\frac{1}{3}$ inch apart: lower leaves obovate-obtuse, narrowed to the short petiole; upper oblanceolate, or oblong-ovate, cut off square at the base: veins three or four pairs. Pedicels solitary or fascicled in the upper axils, slender, $1\frac{1}{2}$ to 2 inches hairy. Flowers $\frac{3}{4}$ inch lateral, sepals $\frac{1}{3}$ by $\frac{1}{12}$ inch linear-acute, hairy; lip with a sac $\frac{1}{6}$ to $\frac{1}{4}$ inch deep. Standard rose-pink, nearly circular, distinctly keeled, mucronate. Wing petals pinkish-purple or mauve; the outer (and main) lobes rounded, $\frac{1}{4}$ inch across; posterior lobe $\frac{1}{10}$ inch wide, falcate. Capsule $\frac{1}{3}$ to $\frac{5}{8}$ inch. Seeds dark brown, smooth and shining. t. 51. Wight Ic. t. 969.

Nilgiris: in swamps, Ootacamund downs (*Bourne* 5208, 5988) Dodabetta. Pykara on bank above the rapids. Not recorded from other hills.

In F.B.I. this species is reduced to *I. tomentosa* Heyne from which however it differs in several respects, prominently in not having the small horizontal spur at the bottom of the sac. (Wight No. 453 and his *I. ovalifolia* ')

In the figure: *a.* two-lobed lateral petal; *b.* the anterior petal (outer in bud); *c.* a narrow lateral sepal; *d.* posterior sepal (anterior in flower). It is petaloid and produced into a nollow sac [E.T.B.]

Bourne No. 3208 was named by Sir J. D. Hooker, but I feel sure by a slip, *I. diversifolia* Wall. var *ecalcarata*.

Impatiens tomentosa Heyne, *Wight's Kew dist.* No. 317 and Ic. t. 749; F.B.I. i 449 *ex parte*, VIII 23; Red Liberty Cap. Stems usually a little branched below, red, very variable as regards hairiness, from glabrous to densely pubescent in the same locality, and as regards length running up to 18 inches and rooting at the lower nodes in water of varying depth, but by the edge of deep constant pools short and erect. Petioles variable, $\frac{1}{4}$ inch or less. Upper leaves narrow, oblong-acute, $\frac{3}{4}$ to $1\frac{1}{2}$ inches by $\frac{1}{4}$ inch; lower shorter and broader, the lowest sometimes $\frac{1}{4}$ inch only and nearly as broad;

variable like the stem in respect of hairiness; remotely serrate with pink-tipped teeth. Stipules only on fully developed leaves, as short soft spines which early wither and fall. Flower-stalks one to three usually three the middle bud not opening; glabrous or pubescent, but always with a single line of pubescence following the twist of the stalk from the upper side at the base to the lip; $\frac{1}{2}$ to $\frac{3}{8}$ inch but lengthening continuously till in fruit about 1 to $\frac{1}{8}$ inch long; with a small persistent bract at the base. Buds pointed, the standard covering the back completely. Flowers $\frac{1}{3}$ to $\frac{1}{2}$ inch of various shades of rose pink to almost yellowish white in the more pubescent forms: wings mauve or magenta, splotted with dark purple near the crimson base. Spur short somewhat variable but always present: lateral sepals linear $\frac{1}{4}$ by $\frac{1}{20}$ inch: wing with one large lobe narrowed at the base where it joins the other much smaller one, rather larger in the more pubescent forms and projecting over the edge of the lip. Capsule pointed at each end, about $\frac{1}{3}$ by $\frac{5}{32}$ inch. Seeds about five, black, smooth and shining, but slightly compressed from a globose shape; not variable. t. 52. Wight Ic. t. 749.

Pulneys: on the Kodaikanal downs. *Fyson* 351, 354. *Bourne* 316, 503, 5208.

The above description is taken very largely, and in part verbatim, from a note made by Sir Alfred Bourne, "after examination of many living specimens." The plant is quite common on the Kodaikanal downs wherever there is water (and there are several streams and much marshy land there), and occurs in such varying states as regards size and hairiness that it is impossible to separate it into two varieties though the extremes might almost be considered sufficiently distinct to be classed as species. Its most constant characteristic features are the redness of the stem and the peculiar short-spurred lip, in shape like an inverted cap of liberty. *I. rufescens Benth.* united with this in *F.B.I.* is quite a different plant.

Impatiens leschenaultii Wall. Cat. 4739!; *F.B.I.* i 450, VIII 27; common shrubby Balsam. A well branched very leafy plant 2 to 3 feet high (or more in shady places) with stem at the base as thick as the

finger : branches perfectly glabrous, smooth, four-angled, and conspicuously swollen at the nodes. Leaves sub-opposite or whorled : blade $\frac{3}{4}$ to 2 by $\frac{1}{4}$ to $\frac{5}{8}$ inch, elliptic, acute at both ends or acuminate, crenate, with a few very distinct hair-points, $\frac{1}{16}$ inch long, towards the base, glabrous ; petioles shorter ; stipules linear, $\frac{1}{10}$ inch. Flowers nearly white, with some pink. Flower-stalks mostly solitary in the upper axils, 1 inch, very slender, glabrous. Lateral sepals minute : lip boat-shaped, yellow : spur slender tinged with red on the lower side, and ending in a slightly swollen yellow tip. Corolla open, nearly flat, 1 by $\frac{3}{4}$ inch : terminal lobe of wing 1 to 6 $\frac{3}{4}$ inches, nearly straight on the inside but notched near the end and broadest opposite this notch ; lateral lobes triangular, $\frac{3}{8}$ by $\frac{1}{4}$ inch. Standard, circular, notched at the top with small spur behind. Capsule up to $\frac{5}{8}$ by $\frac{3}{8}$ inch. Seeds thickly rugose. t. 53. Wight Ic. t. 970 bis.

Common near Ootacamund in shady places or even where partly exposed as on the edge of a shola, and in flower at all times. *Fyson* 54, 2203, 2325, 3006.

This is the wild Balsam most commonly grown in gardens at these levels.

Impatiens latifolia Linn. ; *F.B.I.* i 450, VIII 26. In general habit and shape of leaf-like *I. leschenaultii* but larger, the leaf-stalks and blades 2 to 4 inches long. "Stem grooved. Fruiting pedicels erect, flowers pink-purple very flat-looking" [*E.T.B.*]. t. 54. Wight Ic. t. 741.

Nilgiris : (Wight, Gamble, Meebold) Neduvattum to Pykara by streams.

Not apparently as high as Ootacamund. All my specimens from this level appear to be *I. leschenaultii* Wall. but it is very difficult to distinguish the two species. *F.B.I.* describes fruiting pedicels as deflexed.

In t. 54 : *a.* pedicel with lip boat-shaped lip and spur, staminal column and standard in face view ; *b.* pedicel with lateral sepals and standard from behind ; *c.* a two-lobed wing [*E.T.B. sheet No. 6147*].

***Impatiens goughii* Wight Herb. ! ; F.B.I. i 452, VIII 33 ; Gough's Water Balsam.** A delicate well branched herb, 4 to 8 inches high, but sometimes with longer horizontal stem from which erect branches rise ; quite glabrous. Leaves without stipules, mostly opposite or often two to three near each other, the internodes varying much in length : stalk $\frac{1}{8}$ to $\frac{1}{4}$ inch : blade up to 1 by inch, ovate-lanceolate acute, often rounded at the base but drying acute, coarsely serrate (seven to ten teeth on each margin), glabrous, thin. Peduncles $1\frac{1}{2}$ to 3 inches solitary in the leaf-axils but often falsely whorled, slender : pedicels falsely umbelled in the axils of minute bracts, $\frac{1}{3}$ to $\frac{3}{4}$ inch, capillary. Flowers pink, $\frac{1}{6}$ to $\frac{1}{4}$ inch across, in shape not unlike a UTRICULARIA : buds globose. Lip shallow, spur half its length acute, curved slightly, forwards. Wing petal with a slight projection at the base fitting into the spur and two lobes : the terminal lobe with a shallow bay in the end side, the lateral lobe rectangular rounded at each end and attached at the side. Standard nearly circular with short spur just below the upper margin. Capsule ovoid, acute at both ends, $\frac{1}{6}$ inch. Seeds hairy. t. 55. Wight Ic. t. 1603. Bourne 2263,* 2826.

By the side of streams. Pulneys : below and near Kodai-kanal (*Barber* 7582 !) Nilgiris : Pykara and below.

Gen. Dist. Western Ghats 5,000 to 7,000 feet.

***Impatiens campanulata* Wight ; F.B.I. i 463, VIII 70 ; White Sun-bonnet.** A stout herb, $1\frac{1}{2}$ feet high and upwards, not much if at all branched, glabrous. Leaves all alternate, $3\frac{1}{2}$ to 4 by $1\frac{1}{2}$ to $2\frac{1}{4}$ inches broadly elliptic, acute at both ends, crenate with sharp points which are especially conspicuous near the base ; stalk $\frac{1}{2}$ to 2 inches. Peduncles stout, 2 to 3 inches ; pedicels $\frac{3}{4}$ inch, crowded (three to five) near the top in axils of ovate-lanceolate bracts $\frac{1}{3}$ inch long. Buds ovoid acute with a very distinct

hooked point showing on the apex of the large standard, and enclosed by the sepals which hides the short swollen spur. Sepals nearly $\frac{1}{2}$ inch, broadly ovate with short acumen: lip $\frac{1}{2}$ by $\frac{1}{6}$ inch in depth, with very short slightly turgid spur. Corolla campanulate, horizontal with the lower side rather longer than the upper; wings laterally concave, the terminal lobe obovate retuse or obliquely obcordate, with a small yellow auricle on the inner side near the base; lateral lobe much smaller. Capsule glabrous, turgid, pointed at each end. Seeds globose.

Easily recognised by the horizontal campanulate corolla, which might be likened to an open mouth with protruding tongue, or to a white sun-bonnet facing upwards. Wight Ic. t. 744.

On the outskirts of sholas and in other shady places; common on the Pulneys at 7,000 feet. *Bourne* 392.

No specimens from other localities seen.

Impatiens phœnicea *Beddome*!; *F.B.I.* i 466, VIII 81; Red Helmet or Scarlet Balsam. Stem slender, branched or not, 1 to 3 feet, very dark coloured. Leaves alternate, dark green, 2 to $5\frac{7}{8}$ by to $1\frac{1}{4}$ inches elliptic-acute or occasionally ovate with blunt cusp, crenate-serrate; stalk $\frac{1}{2}$ inch. Flowers racemed, four or five along the uppermost third of axillary peduncles 2 to 4 inches long. Bracts ovate $\frac{1}{6}$ inch, persistent; pedicel slender, 1 inch nearly horizontal when the flower opens. Flower in shape somewhat different from other balsams, rather narrow for its depth, with the lip narrowing into the trumpet-shaped spur, and the standard more than usually helmet-shaped. Sepals $\frac{1}{8}$ inch obliquely ovate with a short point; lip $\frac{1}{3}$ inch and its spur 1 inch, but the two hardly separable, blood-crimson, trumpet-shaped with swollen tip. Wings scarlet, but yellow at the base, with an oblong terminal lobe and a smaller lateral cordate one, not much exerted; standard scarlet, deeply

vaulted, with a rose pink ridge down the middle of the back. t. 56.

A very striking plant, its bright scarlet flowers showing up against the dark green foliage. There are in these levels no other Balsams at all like it in colour.

In woods, quite common on the Pulneys, flowering from June but most by September to October. *Bourne* 80, 81, 2830.

Gen. Dist. Western Ghats, Pulney and Tinnevely hills, above 6,000 feet.

RUTACEÆ.

A family easily recognised by the very numerous small oil glands in the (usually pinnately) compound leaf, which show against the light as translucent dots. (In a few genera, as the Orange, one leaflet only is developed.) Flowers quite regular, with all the parts in fives or fours; calyx always very small; anthers opening inwards; and inside the stamens a prominent honey-secreting disc.

A fairly large family of 650 species, confined almost exclusively to the warmer parts of the world, more especially South Africa and Australia. In Europe it is hardly represented at all, the common Rue, *Ruta graveolens* L. a native of the Mediterranean being almost the only species found.

RUTA or RUDA was the Anglo-Saxon name for that plant, and appears to be a very old word, for we find different forms of it in Greek, Latin, Hindoostani and Slavonic.

Tree : leaves opposite, of three leaflets; not prickly. *EVODIA*.
Climbers :—

Leaves alternate, of five leaflets; very prickly; wood yellow.
XANTHOXYLUM.

Leaflets three; older parts of the stem an inch or more thick
and with large pyramidal corky warts . . . *TODDALIA*.

TODDALIA.

F.B.I. 33 IX.

Climbing or straggling woody plants, armed with prickles. Leaves sessile, or three leaflets. Flowers

small, in cymes or panicles, unisexual. Stamens of the male flower as many or more than the petals. Ovary of the female flower egg-shaped, entire, the carpels completely united, each with two ovules. Fruit leathery or fleshy berry of several cells each with usually one seed.

Species 9, in the tropics of the Old World mainly of Africa.

Name taken direct from the Malayalam name kaka-toddali.

Toddalia aculeata Pers.; *F.B.I.* i 497, IX 1; the Toddali. A rambling woody plant, with stem near the ground as thick as one's arm or, higher up, as one's wrist, and there studded with pyramidal lumps of cork three-quarters of an inch high. Twigs armed with curved prickles. Leaves alternate, three-foliate: petiole 1 to $1\frac{1}{4}$ inches, with an occasional prickle: leaflets sessile, 1 to 3 by $\frac{1}{2}$ to 1 inch, obovate cuspidate with short blunt acumen notched at the end, coriaceous, glabrous, finely crenulate, dark green: midrib strong, lateral veins numerous, slender, parallel nearly to the margin. Flowers white $\frac{1}{3}$ to $\frac{1}{2}$ inch across, in close axillary cymose panicles 2 to 3 inches long; unisexual. Calyx very small. Petals oblong, thickened and incurved at the apex, male flowers globular in bud, the petals shorter. Stamens equal in number to the petals; ovary rudimentary. Female flowers oblong in bud, the petals longer and the ovary well formed on a low disc, with a nearly sessile stigma lobed like it. Fruit the size of a pea, with a few angular seeds. Embryo bent, enclosed in a fleshy endosperm. t. 57. Wight Ill. t. 66.

In sholas very common on both the Nilgiri and Pulney downs; extending even down to the plains and all over South India. Very variable in regard to the size and breadth of the leaflets, and on the plains usually a low shrub with smaller and narrower leaflets.

Gen. Dist. Widely over the Indian and Malayan tropics, to Java, Sumatra, China and the Philippines.

EVODIA.

F.B.I. 33 V.

Unarmed trees and shrubs with opposite, simple or tri-foliate or odd-pinnate leaves; and small flowers in paniced cymes, with deeply four-lobed ovary which in fruit divides into two or four hard dry carpels each with one shining seed.

Species about thirty, in tropical Asia, Pacific islands, East African islands, Australia.

Evodia roxburghiana Benth.; F.B.I. i 487, V 1. A small well branched tree with dirty green foliage. Leaves of three leaflets: main stalk 2 inches: stalks of the leaflets $\frac{1}{4}$ inch. Leaflets nearly equal quite glabrous, obovate-oblong, entire, rounded at the apex or with a short point: nerves numerous, parallel, conspicuous when dry. Panicles long-stalked, axillary: branches horizontal. Flowers yellow-green, small, in dense clusters of $\frac{1}{4}$ inch across. Seeds black, shiny.

Nilgiris: at Pykara very common in the sholas. Not at higher levels.

Gen. Dist. On lower hills, e.g., Shevaroys, Agastirmallay, Shakloppur: northward to the Khasi hills and eastwards to Ceylon, Sumatra and Java.

XANTHOXYLUM.

F.B.I. 33 VIII.

Yellow-wood.

Shrubs or trees with yellow-wood, usually prickly. Leaves alternate, pinnately three or more-foliate. Flowers small, the parts three, four, or five; unisexual. Ovary deeply lobed; carpels with two ovules each; when ripe globose with one black shining seed which may hang from the opened carpel for some time.

Species 80 in the hotter parts of the world.

Xanthoxylum tetraspermum Wight and Arnott; *Herb. Wight Prep.* 9811; F.B.I. i 494. VIII. 8; common

Yellow-wood. A woody climber covered all over the young parts with short curved prickles, glabrous except for the velvety cymes. Leaves 4 to 7 inches, very prickly on the stalk. Leaflets usually five, nearly sessile, elliptic-ovate and suddenly contracted to a $\frac{1}{4}$ inch notched tip, crenate-serrate, shining above, with numerous nearly parallel veins. Panicles axillary and terminal. Flowers nearly sessile, bunched at short intervals on the alternate branches. Calyx very small. Petals four, $\frac{1}{10}$ inch valvate. Stamens twice as long. Ripe carpels four, $\frac{1}{5}$ inch diameter, woody, opening to expose the single, black, very shining seed which remains attached some time before falling.

In sholas; belonging rather to the lower limits of our area. Nilgiris: Kotagiri at 6,600 feet. *Fyson* 1698. Pulneys: Shembaganur, etc. Not Kodaikanal.

Gen. Dist. Nilgiris and Kurg mountains.

For a note on the significance of the seeds remaining on the plant see under *Ternstroemia japonica*, p. 40.

ICACINACEÆ.

Trees and shrubs with alternate entire leaves; flowers in compound panicles, with lobed calyx, four or five petals and stamens, and one cell only to the ovary, in which are two ovules pendent from the top of the cell, with their micropyles pointing inwards and upwards; fruit usually a drupe.

Species about 200, chiefly tropical.

MAPPIA.

F.B.I. 39 XV.

Mappia foetida *Miers*; *F.B.I.* (including *M. ovata*) i 589, XV 2 & 3; Stinking May tree. A tree with dark foliage and small extraordinarily evil smelling flowers. Branches angular with large leaf-scars. Leaves 5 by 3 to 12 by 7 inches on the same branch, alternate, shortly petioled, broadly ovate or obovate, abruptly acuminate, entire,

sparingly hairy on both sides, especially on the nerves; standing erect when young and folded along the midrib, later on laxly spreading: nerves about six pairs, rather straight and closer towards the base: stalk $\frac{1}{4}$ inch. Flowers in terminal cymose panicles, white; buds very hairy. Calyx small. Petals five, free or slightly united, hairy inside, about $\frac{1}{8}$ inch long. Stamens five, free of the petals, with slender filaments. Ovary superior, one-celled. Fruit a drupe, $\frac{5}{8}$ inch long, like a small Olive. Seed in the stone pendent. t. 58. Wight Ic. 955.

A common shola tree. Nilgiris: about Ootacamund and below. Pulneys: on the downs. *Fyson* 1710, 1760, 1785, 1832. *Bourne* 564, 830, 1830.

Gen. Dist. Western Ghats and Mysore.

The genus is a small one of about 7 species, in Asia and tropical America.

ILICINEÆ.

ILEX.

F.B.I. 40 I.

Holly.

Practically the only genus of the family, having 150 or more species, the other genera with one or two only.

Trees with rather hard and stiff, erect or spreading, simple alternate glossy leaves, entire or toothed and small white, unisexual or occasionally perfect, flowers $\frac{1}{4}$ inch or less in diameter, massed in short cymes or umbels at the leaf-axils, not in showy inflorescences; the sexes usually on separate trees (dioecious). Petals four to five, sometimes united at the base. Stamens on the male trees of the same number. Ovary on the female trees with short thick style, of four cells each with one ovule only, hanging from the top corner with its micropyle facing inwards and upwards, with a thickened funicle. Fruit a drupe with two or more small stones.

Distributed in the tropics chiefly, of Central and South America, Asia, Africa, Australia; and one species, the common Holly in Europe.

Leaves nearly or quite entire; female flowers in small umbels *I. wightiana*.

Leaves serrate, often very thick; pedicels of the female flowers springing direct from the branch *I. denticulata*.

Ilex denticulata Wall.; *F.B.I.* i 600, I 7. A tree, often very large with thick spreading branches. Leaves $2\frac{1}{2}$ to 3 inches, serrate elliptic or elliptic oblong acute or obtusely acuminate, when mature thick and very tough when dry. Male flowers in small branched cymose panicles up to $\frac{3}{4}$ inch long, in the leaf-axils, with minute bracts. Calyx with four or five triangular teeth. Petals four or five in the same cyme, nearly free imbricate white, round, $\frac{1}{8}$ inch across. Stamens as many, with very short filament and thick anther, $\frac{1}{20}$ inch. Female flowers pedicelled in axillary fascicles. Petals free. Stamens often with long filaments persistent till the fruit ripe, their anthers (?) sterile. Ovary four-celled. Fruit the size of a pea, with four stones. Wight Ill. t. 142.

In sholas quite common especially on the Nilgiri downs from Ootacamund to Pykara. *Fyson* 1119,* 1894,* 2000, 2399, 3007. *Bourne*.

Gen. Dist. South India and Ceylon.

Ilex wightiana Wall.; *F.B.I.* i 603, I 16. Flowering as a small but growing to a very large tree, with branches numerous and sloping steeply upwards; bark grey, lenticelled. Leaves 2 by 1 inch or less, elliptic, acute or not, entire or with a few small teeth near the end; stalks reddish, and young blades red and erect. Flowers white, $\frac{1}{8}$ to $\frac{1}{6}$ inch across fascicled or in peduncled cymes or compound cymes; sometimes few only, sometimes many together; peduncles and pedicels $\frac{1}{8}$ inch red. Petals four, six to obtuse, united at the base.

Stamens in the male flowers attached to the base of the corolla, anthers heart-shaped, filaments stiff and thickened at the base. Fruit the size of a small pea. t. 59. Wight Ic. 1216.

Very common both in sholas and in the open. Nilgiris: in Ootacamund itself in many gardens, e.g., Rosemount. Snowdon, Pykara, on the open hill-sides as small rounded trees, 10 to 15 feet high. Pulneys: in sholas, sometimes as very large trees. *Fyson* 1904, 2201, 2474, 2475, 2537, 2543.

Gen. Dist. Mountains of South India.

CELASTRACEÆ.

Shrubs and trees with opposite or alternate simple leaves; small perfectly regular flowers, yellowish or greenish or purplish brown in colour, in some kind of cymose inflorescence; and two erect ovules to each cell of the ovary. There is usually, but not always, a well marked disc round and above the ovary on which the stamens are borne; and there is usually also an aril, often brilliantly coloured, on the seed.

Species about 300 in the warmer parts of Europe, North America and Asia.

Leaves alternate: large climber, flowers yellowish in drooping panicles CELASTRUS.

Leaves opposite.

Leaves stiffly erect; flowers yellowish, without disc; capsule two-valved; seed one only without aril MICROTROPIS.

Leaves spreading; flowers brownish purple, three or seven on slender axillary peduncles; disc well marked; capsule red, five-valved; seeds five with red or orange aril . . . EUONYMUS.

EUONYMUS.

F.B.I. 41 I.

Spindle-tree.

Small trees and shrubs with opposite simple leaves and flowers in peduncled cymes with large disc covering the ovary, but chiefly distinguished by the angular or

winged pear-shaped capsule from which after dehiscence hang the brilliantly coloured seeds with their large red or orange arils.

Species about sixty, mostly in India, especially on the Himalayas. Malaya has four or five, the Phillipines two, Australia, North America and Europe one each. The last is the Spindle tree of England. *Fr.* Fusain. *Ger.* Spindlebaum.

***Euonymus crenulatus* Wallich, ex Wight and Arnott** *Prod.* 161; *omitting* Wall. *Cat.* 4409. *Herb. Wight. Prop.* 482!; *F.B.I.* i 608, I 4; the Spindle-tree. A small tree or shrub with rather loosely spreading branched and yellowish green leaves more or less horizontal so that the foliage is in flat tiers and light. Year's shoots four-angled, not or slightly lenticelled. Leaves all opposite, shortly petioled, elliptic, or occasionally ovate, coriaceous, entire or obscurely serrate towards the top, quite glabrous; margins revolute, midrib strong but nerves obscure. Flowers in small cymes or cymose panicles of three or seven, on slender peduncles 1 inch long, often in pairs in the upper leaf-axils. Bracts and bracteoles minute; pedicels $\frac{1}{8}$ inch; buds globular $\frac{1}{8}$ inch. Calyx of four or five rounded sepals. Petals $\frac{1}{6}$ inch, rounded, purplish brown, surrounding the thick fleshy disc on which stand the four or five stamens with broad anthers. Ovary sunk in the disc with short thick style, of five cells each with two ovules hanging from the upper corner. Fruit a brilliantly crimson pear-shaped capsule (with the dried calyx as a ring at its base), opening so as to allow the five or more orange-coloured seeds, each capped by a large orange red aril, to hang down on slender but firm stalks, where they remain some time attached to the valves, against whose silvery white inner surfaces they are very conspicuous. t. 60. Wight *lc.* 973.

Microtropis microcarpa also had its flowers on slender peduncles, but in the absence of the fruit may be distinguished by its erect and darker leaves

In sholas everywhere on both plateaus, quite common; on the Nilgiris especially near Pykara. *Fyson* 315, 1729, 447. *Bourne* 109, 834, 1369, 2048.

Gen. Dist. South Indian hills.

The wood of this genus is usually hard and can be put to a variety of uses; that of our species and several others is, according to Col. Beddome, one of the best substitutes for Boxwood. The red aril on the seeds is said to be used in some parts of India by women to mark their foreheads. For a note on the persistence on their capsules of brilliantly coloured seeds see *Ternstroemia japonica Thunb.* p 40, and compare *Polygala arillata*, p. 26, cf. also *Botany for India*, pp. 264-9.

MICROTROPIS.

F.B.I. 41 III.

Trees with simple opposite, leaves; conspicuously erect, with revolute margins; flowers in terminal much-branched cymose corymbs or in dense clusters on the thick branches; petals united at the base; disc reduced to a ring or absent altogether; ovary with two ovules in each cell; fruit a capsule with only one seed, and opening in two valves; seed without aril.

Species 10 on the mountains of India, Ceylon, the Malay peninsula and Java.

The two or three species which occur here are unlike each other in general appearance, and in respect of the absence of an aril to the seed and often too of any disc to the flower are not typical of the family.

Branchlets thick; flowers almost sessile in dense clusters

M. ramiflora.

Branchlets normal; flowers in terminal and axillary corymbs;
fruit brown *M. microcarpa.*

Branchlets normal; flowers in terminal and axillary corymbs;
fruit crimson *M. ovalifolia.*

Microtropis ramiflora Wight; F.B.I. i 613, III 3; distinguished from all others of the order and from practically all other trees by the dense clumps of small stalkless flowers along the rather thick branchlets: and among trees in general remarkable for its very stiff nearly erect dark green oval leaves with margins curled back,

A medium-sized tree with thick branches and smooth dark purple twigs. Leaves opposite or nearly so, erect, stalk $\frac{1}{8}$ to $\frac{1}{4}$ inch, without stipules; blade 1 to 4 by $\frac{3}{4}$ to 3 inches, broadly elliptic or obovate, coriaceous, quite glabrous; margin entire, strongly revolute; midrib strong, nerves about six straight. Flowers honey-scented; clusters at length thick and woody. Sepals imbricate, rounded, with scarious broken margin. Petals $\frac{1}{8}$ inch, broadly obovate, spreading.* Stamens alternate with the petals and attached to them and to each other by a thick ring well above the ovary. Fruit an ovoid capsule, $\frac{5}{8}$ inch long, brown (not unlike a Sapodilla), with the persistent unequal sepals at the base, and a short sharp point; and opening by two valves which fall off before the seed. Seed one only, red, without aril, erect; cotyledons leafy, orbicular, flat; radicle pointing downwards. t. 61. Wight Ic. t. 977.

In sholas, easily recognised by the foliage. Pulneys: on the downs above and round Kodaikanal and below. Nilgiris: in the sholas of the plateau, frequent. *Fyson* 2596. *Bourne* 493.

Gen. Dist. Also in Ceylon.

In t. 62: *l.* bud from above; *c.* corolla opened showing the stamens on the annular disc; *d.* a closed, faded, flower; *e.* section of flower; *c.* calyx tube; *s.* sepal; *p.* petal; *d.* disc; *o.* section of ovary; *d.* above a cluster of fruits, one open and showing the solitary seed; *f.* seed with aborted ovule and carpels at the base.

Microtropis microcarpa *Wight*; *F.B.I.* i 614, III 5; shrub or small tree with the stiffy erect leaves of a MICROTROPIS, but the slender peduncles of a EUONYMUS. Tree up to 20 feet with ascending branches. Foliage bluish green; leaves stiffly erect, elliptic or broadly lanceolate, 1 to 2 inches by $\frac{3}{4}$ to $1\frac{1}{4}$ inch, quite glabrous, coriaceous; obtuse and notched: margin revolute; stalk $\frac{1}{8}$ inch. Flowers in cymose corymbs, peduncled

* *F.B.I.* in description of genus says petals erect.

into the leaf-axils. Sepals two to four, scarious persistent. No disc. Style with four-notched stigma. Fruit oblong; $\frac{1}{2}$ by $\frac{1}{5}$ inch, asymmetric, the small styler point to one side of the top. Wight Ic. t. 975.

Nilgiris: Ootacamund on Elk hill, Kotagiri, *Fyson* 2015, 2592.

Gen. Dist. Western Peninsula, Mysore, Concan.

Microtropis ovalifolia *Wight*; *F.B.I.* i 614, III 6; a shrub. Leaves smaller and narrower and more pointed than the last species, but like them hard, smooth, and with recurved margin. Flowers in cymose panicles on axillary peduncles; buds $\frac{1}{8}$ inch egg-shaped or obconic; petals united. Fruit $\frac{1}{2}$ by $\frac{1}{5}$ inch, seated on the enlarged calyx and containing one crimson seed. t. 62.

Nilgiris: (*Wight, Bourne*).

CELASTRUS.

F.B.I. 41 VII.

Climbing shrubs with alternate leaves and panicles of small flowers, of the family type: characterised by the ovary being free of, or but half immersed in, the disc; the stamens inserted on the margin of the disc; style with three-lobed stigma; fruit a dehiscent capsule.

Species 40 in Asia, Australia, Polynesia, and North America.

The name is of Greek origin and connected with the word KEELAS meaning the latter part of the year, because the seeds ripened rather late on in the autumn and hung some time on the tree. But the Greek KELASTROS was probably a EUONYMUS.

Celastrus paniculata *Willd.*; *F.B.I.* i 617, VII 1. A large woody climber or straggler over trees, characterised by the numerous short leafy shoots of the current year, rising each from a cup or swelling marking the bud scales, covered with shiny grey skin studded with numerous pale lenticels, and ending during the early summer months in large drooping panicles of small

yellowish flowers. Leaves alternate, oblong-elliptic nearly circular or obovate, usually cuspidate, finely crenate (the teeth $\frac{1}{16}$ inch apart about) from near the base to the apex, in length about 3 inches (one to four), with five or six main pairs of nerves arching from the midrib. Pedicels $\frac{1}{16}$ inch, with minute bract and bracteoles at the base. Calyx $\frac{1}{16}$ inch deep, sepals rounded, imbricate. Petals $\frac{1}{10}$ inch, yellowish-green, surrounding a cup-like disc which is clear of the ovary. Filaments of stamens short; anthers as long. Ovary three-celled; style very short. Fruit the size of a pea, on a slender pedicel now lengthened to $\frac{1}{4}$ inch or more and thickened at the top below the persistent but not enlarged calyx; opening loculicidally in three roundish shortly pointed valves, which break away from the axis, each with one seed imbedded in a red fleshy aril; radical pointing downwards. t. 63. Wight Ill. t. 72.

In sholas, commoner at lower levels. Pūlneys: near Kodai-kanal, Bearshola, etc., and below. Nilgiris: Kotagiri and below. *Fyson* 1077. *Bourne* 834.

Gen. Dist. Hilly districts of India—Mysore, Wynaad, etc., Ceylon, Malay Archipelago and the Phillipines.

RHAMNACEÆ.

Buckthorn.

The chief distinguishing characteristic of this family is the arrangement of the stamens, for being equal in number to the petals they stand not between them, as in all other families with isomerous stamens (except that of the Grape-vine) but opposite, that is alternately with the sepals.

Plants all woody, either shrubs or small trees, never herbs. Leaves nearly always alternate, but sometimes approximate in pairs or are even quite opposite: simple, shortly stalked and finely toothed glabrous on the upper

side, but not hard and glossy like those of Ternstroëmiaceæ: usually all in one plane, facing upwards (bifarious).

Flowers small and greenish, with yellow centres (disc): in bunches (cymes, fascicles, or small umbels) at the leaf-axils. Sepals and petals either five or four. Stamens as many quite short, and in some genera covered by the spoon-shaped petals. Ovary of two (or three) cells surrounded by or imbedded in the yellow disc. The nature of the disc, whether it completely fills the calyx cup, and so covers the ovary, or is only a saucer-shaped lining to it is used to class the genera in their "tribes." Fruit fleshy, with one to three stones, quite free from the rest of the flower or girt up to its middle by the calyx tube (i.e., partly inferior).

Species 500, in all parts of the world, wherever trees grow. In Europe the common and the Alder-Buckthorn, *Rhamnus cathartica* L. and *R. frangula* L. *Ger.* Wegdorn are wild. *R. alaternus*, and various species of *Ceanotus* and *Pomaderris* are common in English gardens.

Name said to have been taken from the Celtic word RAM meaning a tuft of branches, in allusion to the habit of the Buckthorn.

Flowers flat, or receptacle hemispheric, not woolly. RHAMNUS.
Receptacle egg-shaped, very woolly POMADERRIS.

RHAMNUS.

F.B.I. 42 V.

Buckthorn.

Shrubs and trees with alternate penninerved leaves and small greenish flowers fascicled in the leaf-axils; characterised by the disc being only a thin lining to the hollowed receptacle (not filling it), and the fruit a berry-like drupe, girt at the base by the remains of the calyx. Petals small, spoon-shaped, enclosing the stamens.

Species about 70, in temperate climates of the northern hemisphere.

Branches ending in spines : leaves tufted on short spurs ; floral parts in fours. Shrubs or trees usually in the open.

R. virgatus.

No spines : leaves all scattered, dark dull green : parts of the flower in fives. Shrubs or trees very common in woods.

R. wightii.

***Rhamnus virgatus* Roxburgh ; F.B.I. as *R. dahuricus* Pall. i 639, V 3 ; the Indian Buckthorn.** In dry places a very spiny, stunted shrub, with tufts of small, finely toothed, leaves, and white, thin, smooth bark. Shoots of two kinds (i) ordinary branches $1\frac{1}{2}$ to 6 inches long, with leaves, or more usually leaf-scars, at intervals of $\frac{1}{4}$ to $\frac{1}{2}$ inch ; and (ii) very short shoots (spurs) from the axils of the leaf-scars on (i) barely $\frac{1}{4}$ inch long, crowded with bud-scars and ending in a tuft of leaves. Leaves $\frac{1}{2}$ to $1\frac{1}{2}$ inches or up to 3 inches in moist places ovate acute, a little oblique, finely serrate from near the base to the tip, with usually two veins on either side of the midrib, starting from below the middle. Flowers numerous, on slender pedicels of $\frac{1}{4}$ inch, fascicled in the leaf-axils. Sepals four, narrow acute. Ovary two-celled with two styles. Fruit $\frac{1}{5}$ inch. Seeds plano-convex with a deep furrow on the outer side (Bedd.). A spur (ii) may continue as such for several seasons, or in another year lengthen into a branch of the first kind, and perhaps all the latter start as spurs, for they have usually crowded leaf-scars at the base. The combination of leafless spine-tipped branches and leafy spurs is very characteristic. Since the formation of a spine of necessity terminates the growth of a branch and further extension can be only by a lateral shoot, the spines frequently appear in the forks of the branch system. t. 64.

At high elevations on both Nilgiris and Pulneys : not very common. *Fyson* 3009, *Bourne* 1051, 1001,

Gen. Dist. Punjab. Temperate Himalaya from Simla to Bhotan ; and on to China and Japan.

A close ally of *R. catharticus* L., the common Buckthorn of England, *Fr.* Nerprum medicinal, *Ger.* Kreuzdorn. Also of *R. dahuricus* Pall. of northern Asia which however is not the same plant.

The F.B.I. gives the leaves as glabrous, but those of var *hirsutus* as 2 inches long and pubescent. The leaves seen by me are pubescent on the under side, and especially on the petiole, but are small, in size exactly as Wight's Herb. Prop. 508 ! the type of *R. hirsutus* W. & A. and as figured by Beddome as *R. hirsutus* in Fl. Syl. An. Gen t. X., which is also quoted for this variety in the F.B.I. I find specimens from the north-western Himalaya at high elevations, and also from Burma. Also pubescent and am inclined to think therefore that the var *hirsutus* is not a definite one.

In t. 63 : *b.* flower as seen from above showing the four long sepals ; *c.* flower in section through two opposite sepals ; *d.* the same through two opposite petals, sepals not shown ; *e.* stamen and petal in position as in the flower ; *f.* stamen and petal separated.

Rhamnus wightii Wight and Arnott ; Wight Herb. Prop. 507 ! ; F.B.I. i 639, V 4. A shola shrub or tree, growing on the Kodaikanal downs to a height of 50 feet with branches 15 inches thick at 15 feet from the ground ; twigs dark green and like all the other parts glabrous. Leaves 3 to 5 inches long, elliptic or oblong, shortly acuminate, finely serrate, when dry black. Flowers in fascicles in the leaf-axils ; pedicels shorter than the petioles ; floral parts in fives. Sepals triangular. Petals flat. Styles three. Disc thin. Fruit $\frac{1}{5}$ inch, set on the cup-shaped calyx tube. t. 65. Wight Ic. 159.

Very common in sholas near Ootacamund, and everywhere on the Nilgiri and Pulney downs. The short flowering branches are often arranged in large terminal panicles. Flowers May to September. *Fyson* 2066, 2050. *Bourne* 227, 492, 1502.

Gen. Dist. Western Ghats and Ceylon, at high elevations only.

POMADERRIS.

42 IX. *

An Australian genus one species introduced here, peculiar in its egg-shaped calyx tube and comparatively long flat petals.

Species 20, of which 18 in south and south-east Australia and 2 in New Zealand.

Named from poma a lid and derris skin.

Pomaderris lanigera Sims, Bot. Mag. t. 1823 : IX * 1.

A shrub with softly woolly branches, thick, lanceolate leaves very tomentose below, and wide terminal panicles of long stalked very woolly flowers. Petioles $\frac{1}{2}$ inch, densely tomentose as are all the young parts. Leaves lanceolate: acute or obtuse, 2 to 5 inches, rounded at the base, thick, closely tomentose on the upper and much darker side; densely so with brown hairs on the under: nerves many. Panicles 2 to 5 inches, bracts small, and early caducous: pedicels $\frac{1}{8}$ to $\frac{1}{3}$ inch. Calyx tube lined up to the acute sepals by the thin disc, very woolly. Petals as long, obovate clawed. Stamens half as long again: anthers large. Ovary three-celled: style three-branched. Fruit of three bony cocci, which separate from the central axis dehiscing at the inner angle: embryo flat, radicle pointing downwards. t. 66. *Fyson* 540, 1047. *Bourne* 1271.

Only where planted.

The stamens move one at a time from the petals to which each is at first attached towards the style and shed pollen on the stigma. A good instance of a special mechanism for ensuring self-pollination. *Bot. Mag. l.c.*

AMPELIDACEÆ.

VITIS Linn.

F.B.I. 43 I.

Grape-vine.

The Vines are slender woody plants which climb up trees by the help of tendrils placed opposite some of the leaves. Their flowers are small and in much-branched panicles also placed opposite leaves; and are distinguished from those of almost all other families, except the RHAMNEÆ, by the stamens being opposite not alternate to the petals. The fruit is a berry with three or four seeds which differ slightly in shape in different species, and are therefore of systematic value.

For the morphology of the tendrils and the flowering parts, and the reason of their position opposite the leaves reference may be made to any text-book of Botany.

The genus, as given in the Gen. Plant. and F.B.I. is a small one of 230 species, scattered over the warmer parts of Asia, Africa and Polynesia, but not much in America.

A complete rearrangement of its species, and those of two other very closely allied genera, Cissus and Pterisanthes, and their division into some ten genera has been proposed by Planchon and other continental systematists.

VITIS was the Latin name for the Grape-vine and is connected with the Celtic GVID or GVIN meaning a shrub tree and particularly the best of trees, the one which yields wine. Vid, vigne, wine, wein are of course all from same root-word.

Vitis anamalayana Bedd. Herb. ! (Parthenocissus of Planchon); F.B.I. i 656, 144; Anamalai Wild Vine.

Branchlets quite glabrous, younger smooth, older with a few minute lenticels. Leaves on the young shoots simple, in older three-foliate, stalk 1 to 8 inches.* Leaflets pubescent on the nerves of the under side,* elliptic or obovate, sharply serrate (teeth $\frac{1}{4}$ to $\frac{1}{2}$ inch apart), with long acumen of about 1 inch; the lateral ones very oblique and broader on the outer margin: conspicuously reticulate below. Tendrils branched and bearing small bracts opposite the branches. Flowers in loose cymose panicles,* calyx small, five-lobed. Petals four or five, oblong, with incurved tip, bent right back when open. Disc fused to the ovary and hardly distinguishable except by colour and the secretion of honey. Ovary very thick with short stumpy style and minute stigma. t. 67.

In sholas. Pulneys: on the Kodaikanal downs and below. Nilgiris: apparently only on the edge of our area and below. Anamalais. *Fyson* 3010, 1186. *Bourne* 285, 535,* 1359, 1549.

In F.B.I. i 655-6 the Nilgiri and Pulney plants (Wight Ic. t. 965) are given under *V. himalayana* Brand, a Kashmir species.

* Beddome describes: petiole 1 to 2 inches; leaflets ovatelanceolate; their stalks with glands; peduncles of cymes shorter than the leaves.

My plant (3010) however appears to be the same as Beddome's Nos. 1424 and 1426, and not *V. himalayana Brand* in which species the Nilgiris and Pulney specimens have been put. Wight's Ic. t. 965 is more like it than like *V. himalayana Brandis*, and Wight in his description of the plate says it is not the latter.

SAPINDACEÆ.

The two genera which grow wild here differ so much that it is not easy to illustrate in them the characters of the family, and the different tribes into which it is divided are considered by some systematists as distinct. The Soap-nut and introduced Litchee of the plains, the common Horse-chestnut of England (*Fr. Marrond'Ind*, *Ger. Rosskastanie*), and the trifoliate *Allophyllus Cobbe* of Coonoor and lower levels, are examples of one tribe, the SAPINDEÆ, mainly tropical, in which the seed has a large fleshy aril (the edible part of the Litchee). The Maples of south-east Europe and North America and Japan (*Fr. Érable*, *Ger. Ahorn*) are types of a second tribe, the ACERINEÆ, in which the fruit divides into one-seeded parts which are often as in the Sycamore and Maple (*Acer*) winged. (There is a tree of *A. oblongum* in the garden of Fir Grove, Ootacamund.) *Dodonaea* belongs to a third tribe in which the fruit is a septicidal capsule; and *Turpinia* to a fourth; both distinguished from the first and second tribes by the stamens being outside the disc, and the fourth one is also distinguished by the peculiar hard-coated seeds.

As given in the Gen. Plant. and F.B.I. the family is a fairly large one of between 400 and 500 species, scattered all over the world but more especially in the tropics.

The name is simply SAPO-INDICUS the Indian Soap-nut.

DODONÆA.

F.B.I. 44 XXI.

Shrubs with alternate exstipulate leaves, greenish or brownish unisexual or bisexual flowers with small sepals,

no petals, large anthers, a dry fruit breaking septically into two to six valves, winged on the back, and seeds without aril containing a spirally coiled embryo.

Species 40 to 45 all with two exceptions, Australian.

Named by Linnæus in honour of Rembert Dodoens a botanist and physician.

Dodonæa viscosa Linn.; *F.B.I.* i 697, XX 1. A bush or small tree with thin ascending branches, the youngest angular or compressed, the older round, not lenticelled. Leaves alternate, erect, simple, 2 to 4 inches by $\frac{1}{2}$, $\frac{3}{4}$ inch elliptic or oblanceolate, acute at both ends and narrowed to the hardly distinct petiole, dotted above and below with small surface glands and shining with the secretion poured from them, quite glabrous: midrib prominent, lateral nerves straight, close ($\frac{1}{16}$ inch apart); margin entire revolute. Flowers in terminal cymose bunches, some unisexual. Sepals five, oblong, ciliate. No petals. Stamens eight with large ($\frac{1}{8}$ to $\frac{3}{16}$ inch) anthers and very short filaments, set in the normal flowers outside the small disc which surrounds the ovary, in the purely staminate flowers without disc. Ovary three to four-celled, with short angular style and lobed stigma. Fruit a reddish or pinkish-brown capsule with very thin walls and three or four broad wings, breaking through the partitions into its constituent, winged, cells. Seeds black with only a very short thick stalk, but no aril. t. 68. Wight Ill. i. t. 52. (*D. burmanniana*.)

In open places and on the edges of sholas, very abundant in the drier parts round Kotagiri and the Katee valley on the Nilgiris, less so near Ootacamund, but there is a grove of the plant in a sheltered valley on the slope of Gyapakkum above Pykara, 7,300 feet. *Fyson* 547, 1002.

Gen. Dist. One of the commonest plants in India, extending from the Indus to Ceylon and distributed in all warm countries.

TURPINIA.

F.B.I. 44 XXIII.

Glabrous trees with shining odd-pinnate leaves and panicles of small regular five-merous flowers, characterised and distinguished from the rest of the family by the cup-shaped crenulate five-partite disc inside the ring of five stamens; by the arrangement of the seeds in more than one row in each cell of the ovary; and by the very hard seed coat and straight embryo.

Species 10, widely distributed over the northern tropics of Asia and America, but not known south of the Line nor in Africa.

Named in honour of M. Turpin, a French botanical artist and naturalist.

Turpinia pomifera *De Candolle*; *F.B.I.* i 698, XXIII 1; a shola tree with pinnately compound opposite leaves, and axillary panicles of small white flowers and small berries marked at the top with three fine lines and containing a few very hard and smooth round seeds.

Twigs round, smooth. Leaves opposite, the pair joined by a line above their insertion: leaflets three or five, occasionally seven, the lateral paired, their stalks about $\frac{1}{4}$ inch, the terminal stalk much longer all with a pair of minute stipels; more or less crenate-serrate, coriaceous, glabrous, usually somewhat drooping and folded upwards along the midrib. Branches of the panicle opposite, and repeatedly branched, with small bracts. Sepals five. Petals five, with scarious margins. Stamens, with thin filaments broader at the base, and ovate acute anthers. Ovary three-lobed with three, easily separable, styles. Ovules more or less erect ventral raphe, or hanging with dorsal. Fruit a small berry, nearly round but showing at the top the three cells. Seeds two or three only, smooth and with very hard seed-coat. Embryo straight with minute radicle and large round

cotyledons, enclosed in thin fleshy endosperm. t. 69.
Wight Ic. t. 972.

One of the commonest of shola trees.

Gen. Dist. On the Western Ghats, south-east Himalayas, Assam, Burma, Malay Peninsula down to Penang, Yunnan and China. *Fyson* 446, 646, 1097, 2530. *Bourne* 237, 393.

Honey is secreted and collects inside the cup formed of the unusually high disc and the secretion appears to be freer when the latter is stimulated by being touched as it would be by insects visiting the flower.

In t. 68 : *F.* flower after removal of the sepals petals and one stamen showing the crenulate five-partite disc inside the stamens ; *S.* seed, showing the thick testa and embryo inside ; *S'*. embryo showing large cotyledons and very small radicle.

SABIACEÆ.

A small family closely allied to the Sapindaceæ and represented here by only one genus with two species.

MELIOSMA.

F.B.I. 45 II.

Flowers small, crowded and almost sessile on the branches of racemose panicles. Sepals five, smaller than the petals. Petals three, outer $1/16$ inch, triangular, enclosing all the rest of the flower, two inner reduced to very small bifid scales behind the two fertile stamens. Filaments of fertile stamens strap-shaped with a broad hollowed scale at the top and two globular anthers. Sterile stamens three, as scales fitting over the ovary, with two lateral hollows like double ears. Ovary $1/30$ inch silky. Fruit a small drupe the size of a pea.

Species 45, mostly natives of tropical and sub-tropical Asia ; some in the Antilles and from Mexico to Brazil.

Leaves simple, 6 to 10 inches long, hard ; flowers in large panicles solitary at the ends of the branches. . . . Bastard Mango or Spiræa-tree of Ootacamund and Kodaikanal . . .

M. wightii.

Leaves pinnate ; panicles in the axils of the uppermost leaves and bracts forming flat compound masses. Spiræa-tree of Kotagiri and Coonoor. *M. arnottiana.*

Meliosma wightii *Planch*; *F.B.I.* ii 4, II 3; Bastard Mango; usually a small tree, though in the middle of a shola it may attain a good height, of irregular outline, the foliage being in lumps of a few large drooping leaves: recognised at once, when in flower, by the tall pyramidal panicles of small cream-coloured flowers, recalling those of the Mango.

Branchlets thick, studded with numerous large lenticels $\frac{1}{10}$ inch long, and coated with a yellowish tomentum of branched hairs. Leaves alternate, simple, 4 to 8 by 2 to 3 inches, elliptic or obovate, the youngest with a few short sharp teeth about one inch apart, towards the apex otherwise entire; dark green and glossy on the upper side with a few hairs only, yellow-tomentose on the prominently raised reticulate veins of the lower and more especially in their axils. Panicles terminal, tall and well branched, thickly covered with small flowers, in bud for some weeks before the rains, and then fawn coloured and drooping; when out a creamy yellow. Fruit $\frac{1}{3}$ inch. t. 70. Wight Sp. Nilg. 34 and 35 lc. t. 964, 3. (*Milingtonia*.)

Common in sholas at the highest levels, near Ootacamund and on the Kodaikanal downs. At lower levels its place is taken by the next species. *Fyson* 3011, 379, 2071, 3012. *Bourne* 251, 1360.

Gen. Dist. Western Ghats, Coorg, Mysore, northwards to Bombay and southwards to Ceylon (5 to 7,000 feet).

Meliosma arnottiana *Wight*; *F.B.I.* ii 6, II 9. Spiræa-tree of Kotagiri and Coonoor (not of Ootacamund or Kodaikanal); a round-topped tree, common in sholas and the open hill-side, flowering before the rains with broad shallow cream-coloured masses of small flowers.

Tree 30 or 40 feet in the shola, or in the open 15 to 20 feet; round-topped: trunk thick. Young parts generally and leaf-stalks and midribs clothed with brown

rusty pubescence. Branches angular, with very large lenticels, as much as $\frac{1}{5}$ inch long and leaf-scars of $\frac{1}{2}$ inch. Leaves 6 to 10 inches usually drooping the main stalk with thick pulvinus-like base: leaflets eleven, progressively larger from the basal pair upwards, 2 to 9 by 1 to 2 inches, ovate-lanceolate, acute or acuminate, rounded at the base, glossy on the upper side, dull on the lower; stalk and midrib rusty or pinkish; nerves seven to eleven pairs, tufts of hairs in the axils and much raised on the lower side; secondary reticulation very fine. Flowers in compound panicles made up of panicles in the axils of the uppermost leaves and bracts, each 6 to 10 inches, branches of panicles spreading stiffly, crowded with flowers. t. 71. Wight Ill. t. 53. (" *Milingtonia*."

Nilgiris: very common on the borders of our area: in sholas west of Pykara, down to Neduvattam 6,700 feet and below; Kotagiri especially on the Kodanad road and on the hillside below it. Also in Coonoor at the first bend on the road from the station. Not near Ootacamund or Kodaikanal. *Fyson* 1927.

Gen. Dist. Western Ghats, Coorg, etc., to Bombay, Manipur, Burma and Ceylon.

The flowers have a sweet almost sickly honey smell, and come out early in May before the rains in such quantities as to make the whole tree cream-coloured and unmistakable even at a distance.

LEGUMINOSÆ.

This large order comprises three easily distinguished families. *A. PAPILIONACEÆ* consisting of the Pea, Gram, Bean, Clover, Vetch and their allies; *B. CÆSALPINEÆ* consisting of the Tamarind, CASSIA, POINCIANA, BAUHINIA, and other trees common on the plains; *C. MIMOSEÆ* consisting of ACACIA and its allies. These three families are alike in having one carpel only to the ovary, attached below the rim of the more or less hollowed flower-stalk (*calyx-tube*) and seeds containing a

curved embryo with much proteid matter as well as starch in the thick cotyledons. Most have compound leaves, and both main and subsidiary stalks are attached by a swollen base (*pulvinus*) which bend up or down carrying the leaf and leaflets with them.

The PAPILIONACEÆ, found all over the world, are well represented here; the CÆSALPINEÆ, mainly tropical, are doubtfully indigenous at these levels: the MIMOSEÆ, an almost entirely tropical family, occur only where planted.

PAPILIONACEÆ.

Bean, Pea, Gram, etc.

The flowers of this family are remarkably alike in general appearance, and different from all others. The Sweet-pea may be taken as an example. There is a green more or less bell-shaped calyx with five teeth. Of the petals, the top one is much the largest and wraps round the others in bud: this is conveniently called always the *standard*. Below and inside this are a pair, called the *wings*; and between these again a second pair which are united towards the tip and together called the *keel*. This *keel* encloses the ovary and stamens. The latter ten always in number, are nearly always connected into a tube, either complete, all ten being united (*monadelphous*), or with a split on the upper side in which is one free stamen (*diadelphous*) as in the Sweet-pea. The ovary is attached by a short stalk somewhat below the level of the other parts, to one side of the deeply hollowed centre, and has one row only of seeds inside, attached to the upper edge. It narrows gradually into the style, which is usually bent sharply upwards, and ends in a small stigma. The Sweet-pea has a pod which opens by both the upper and the lower edges, and

this is the usual type of fruit : but in some the pod breaks up transversely into a number of one-seeded sections, which may open or not ; and in a few genera there is only one seed and the pod does not open.

Exceptions to the above are that in the common, introduced Gorse, *ULEX*, the calyx is coloured yellow and divided deeply into two parts ; and that in *SOPHORA* the keel petals are hardly united, and the stamens are all free. Otherwise the flowers are all made on this plan. There are small individual differences, which serve to distinguish the genera. In the Rattle-pods, *CROTALARIA*, and the introduced Gorse and Broom, the anthers are small alternately short and attached lightly by the middle of the back (versatile) or long and fixed firmly at the base : in the Beans, *Phaseolus*, the keel and its enclosed stamens and style, are remarkably long and curled up into a complete spiral. In some genera the keel is sharp-pointed, in others blunt ; in *DUMASIA* is joined more or less firmly at the back to the wing petals. In some the style is hairy all round ; in others only on the upper side ; in others again it has no hairs ; and in one genus, *DUMASIA*, it has a thickening just at the bend. These differences only serve to show the essential similarity of the flowers. Greater and more useful differences occur in the leaves. These may be simple, as in *CROTALARIA*, or composed of leaflets : either three only, all equally stalked (*digitate*) or with the central stalk longer (*pinnately trifoliate*) ; or several, either an even number, or an odd number, (i.e.), in pairs with one at the end ; or as in the Vetch with a tendril at the end. It is chiefly by these differences that the family is divided into sections (tribes).

In all the *PAPILIONACEÆ* the base of the leaf-stalk (or if that is very short as with most leaflets, the whole of it), is swollen, and so constructed as to be capable of bending up or down, and by doing so changes the position of the blade morning and evening : so that while by day the blade is more or less horizontal, at night it becomes more or less vertical. The evening movement is in some cases upwards, in others down ; and often brings the blades not only vertical but also with the upper sides of adjacent leaflets together : and sometimes the leaflet is folded along the midrib with the same effect. It is a protective movement designed to prevent loss of heat by radiation to the sky, and is shared, but to a much smaller extent, by a number of other plants. Attention is here called to it because it is one which one can hardly help noticing if out after dark.

The *PAPILIONACEÆ* show interesting adaptations to the visits of insects to their flowers. In some cases the simple weight of the insect pressing the keel petals down, brings the anthers into contact with its body. In flowers with sharp pointed keel pollen is shed previously out of the anthers and when a heavy insect, such as a bee, alights on the keel, is pushed out by the style. This is the purpose of the hairs below or round the stigma. More advanced still is their

mechanism of the Gorse and Broom. for here the staminal tube is inclined to rise but is held down by the keel, and when an insect presses with more than a certain weight on this, is suddenly released and springing up sends out a cloud of pollen. All these flowers require the visiting insect to be of some weight, and do not waste their pollen on butterflies, but give it to bees. On the other hand there are flowers, mostly of a red colour, in which the release of the stamens is brought about quite easily by a slender proboscis separating the knobs on the wings or keel which hold the stamens down. Such flowers offer honey to their visitors and are adapted for butterflies. These are only the broad outlines. Individual flowers differ in details, and these are well worth investigation. Much may be done by simple experiments with pressing the keel down, or inserting a bristle; but for the really conclusive observations one must watch insects at work on the flowers. The lateral facing of the flower; its blaze of yellow for bees, or red for butterflies, so that the right insect may easily find it; and the little details of anthers, keel, and wings, must all be regarded as designed for the one end of cross-pollination: and the precision with which a flower will open to the insect and close again after planting pollen on that part of its body which will come in contact with the stigma of an older flower, shows how well every part is adapted to its purpose.

KEY TO THE GENERA.

- a { Very spiny green shrub without flat leaves . . *p.* 97. ULEX.
- { Leafy plants b
- b { Anthers alternately long pointed or short rounded . . c
- { Anthers all similar d
- c { Leaves all simple; pod inflated . . *p.* 99. CROTALARIA.
- { Stem green, angular; leaves small or absent. *p.* 98. CYTISUS.
- d { Leaves at least the lower of three leaflets e
- { Leaves odd-pinnate, flowers blue, mauve or pink. . . e
- { Leaves pinnate ending in a branched tendril. *p.* 117. VICIA.
- e { Stalks of leaflets all equal f
- { Stalk of middle leaflet distinctly longer than the others. i
- f { Leaflets notched or heart-shaped, finely toothed; tender
- herbs with creeping stem g
- { Leaflets not toothed—erect or diffuse plants h
- g { Flowers blue and white, solitary or in pairs on slender
- stalks *p.* 111. PAROCHETUS.
- { Flowers in heads, yellow, white or pinkish *p.* 110. TRIFOLIUM.

- h { Small trailing plant, young parts with many black dots p. 112. INDIGOFERA.
 Shrub or herb; leaflets and petals with red dots p. 121. FLEMINGIA.
- i { Pod divided into one-seeded pieces opening along one edge only p. 114. DESMODIUM.
 Pod opening by both edges; twining plants f
- j { Leaflets, etc., with red dots: flowers in stalked pairs p. 119. ATYLOSIA.
 Flowers in racemes k
- k { Keel and style long and coiled in a spiral p. 119. PHASEOLUS.
 Keel short, calyx mouth oblique, hardly toothed p. 118. DUMASIA.
- l { Stamens diadelphous p. 112. INDIGOFERA.
 Stamens all free p. 123. SOPHORA.
- m { Leaflets five or seven, very narrow p. 114. PSORALEA.
 Leaflets three p. 112. INDIGOFERA.

ULEX.

50 VII. *

Furze or Gorse.

Spiny shrubs, the main branches thickly set with short branches ending in thorns and bearing other short thorns and spine-like leaves. Flowers yellow in masses at the ends of the branches and intermixed with thorns; pedicelled in the axils of small bracts. Calyx coloured yellow like the petals, deeply divided into two lips, which are finely toothed and hairy; with two small broad bracteoles at the base. Stamens alternately with short versatile anthers and long rigid ones. Pod short, few-seeded, seeds with strophiole.

Species about 24 scattered over western Europe and North Africa.

Name said to be connected with the Celtic Ac.

Ulex europæus Linn.; VII * 1; common Gorse. Calyx hairy; bracteoles 1/10 to 1/8 inch easily seen, hairy. t. 72. *Bourne* 523.

An introduction well established near Ootacamund and at Kodai-kanal presumably from Britain, where, as Gorse, Furze or Whin, it is common

on dry gravelly ground. The species is spread all over western Europe, wherever the ground is stony, and as far east as northern and central Germany and southwards to Teneriffe, but not to the Mediterranean. *Ger. Stechginster, Fr. Genet piquant.*

If the keel be pressed down it will begin to split against the staminal tube, till pollen is suddenly ejected in a little cloud. (*Cp. Cytisus*).

CYTISUS.

50 VII. **

* *Broom.*

Shrubs with green angular stems, leaves small, three-foliate or simple. Flowers yellow or white, solitary or fascicled in the leaf-axils. Calyx with short broad lips. Stamens all joined into a tube; anthers alternately longer and attached near their base, or shorter and lightly attached by the middle. Pod opening by both edges; seeds many with fleshy outgrowth (strophiole) near the hilum, smooth and olive green in colour.

Species about 40 belonging mostly to the countries bordering the Mediterranean, from one of the islands CLYTHOS, it was said by Pliny to have taken its name.

Flowers white, $\frac{1}{2}$ inch *C. monspessulanus*.

Flowers yellow, 1 inch *C. scoparius*.

Cytisus monspessulanus (*Genista candicans L.*); VII * * 1; White Broom. Stems thin, closely grooved. Flowers white, often several together in a leaf-axil, $\frac{1}{2}$ inch or less. Style glabrous, short, curving upwards but not coiled as in *C. scoparius*. Pod hairy all over, small.

By road-sides in Ootacamund introduced from European gardens, native of Algeria. *Fyson 1986. Bourne 4771.*

Pollen is pushed out by the weight of the insect depressing the keel. There is no explosion as with *C. scoparius*.

Cytisus scoparius Link; VII * * 2; common Yellow Broom. Foliage very dark-green; upper leaves reduced to single leaflets. Flowers usually solitary in the leaf-axils, yellow. Style hairy, very long and coiled. Pod

1¼ by ½ inch smooth, but with fine long hairs down the sutures. t. 73. *Bourne 4772.*

Established in Ootacamund, a native of western Europe, common in England and Scotland on dry hilly wastes. *Ger. Ginster, Fr. Genet.*

The mechanism for cross-pollination is interesting. Insects are attracted by the yellow colour of the flowers, but there is no honey, though the reddish streaks at the bottom of the standard would suggest that honey could be found below. The keel petals and wing petals are interlocked by folds near the base of each, and tend to move downwards, but are prevented by the stamens and style held under the rounded tip of the keel. When a fairly heavy bee alights on the flower it grasps the wings with its middle and hind legs, and pushes its forelegs and head down the opening at the base of the standard. In doing this it depresses the wings and keel-petals, and the latter come apart and allow the five short stamens with their stiffer anthers to spring up and scatter pollen on insect's lower surface. Then the longer stamens also spring out and, with a more violent explosion, scatter more pollen all over the bee. The long style, coiled inside the keel, also comes and winds itself round the insect's body, taking any pollen which the latter may have brought from another flower. Once opened in this way the flowers do not close again.

CROTALARIA. F.B.I. 50 VIII.

The peculiar characteristic of the genus is the inflated pod in which the seeds rattle about when ripe, and its name is from the Greek KROTALON, a child's rattle.

Great differences occur in the general habit, some species being trailing plants, others erect herbs, and others again quite large shrubs or small trees. There are differences too in the stipules, for these may be ear-shaped encircling the axis, or prolonged downwards as narrow wings, or absent altogether. Some species are nearly glabrous, others covered with a shiny coating of silky hairs. And by a combination of these characteristics the genus, being a very large one, is conveniently divided into sections. But the flowers are remarkably uniform.

The calyx has always a short tube and five nearly equal teeth; the corolla, in all our species yellow, has a

broad rounded standard and sharp pointed keel; the stamens are all united into a tube (monadelphous) and are of two lengths, alternately short and long, and with anthers round and versatile, or pointed-oblong and rigidly fixed to the filament; the style has a tuft of hairs at the tip; and the pod, as said above, is always much inflated. All our hill-top species have simple leaves but digitately (not pinnately)-compound leaves also occur. The wing petals have each a patch of minute ridges or puckerings, which no doubt is of value in connection with the visits of insects.

Species about 250, scattered over the tropics and the sub-tropical parts of the world, but not in temperate regions. The F.B.I. gives 77 species for India alone, to which must be added seven or eight founded since.

KEY OF THE SPECIES.

- | | | | |
|---|---|--|--|
| a | { | Stipules broad at the top and decurrent to nearly the next leaf, forming wings to the stem | § <i>alata</i> b |
| | | Stipules ear-shaped and together encircling the stem; a large shrub or small tree with flowers in erect spikes | |
| | | | <i>p.</i> 109. <i>C. semperflorens</i> . |
| | | Stipules small or absent: shrubs or trees; foliage more or less silky | e |
| b | { | Stipules small or absent: herbs erect or weak and trailing | h |
| | | Leaves ovate or lanceolate acute, silky but when dry a little scabrid: erect plants; foliage drying brown . . . | c |
| | | Leaves oblong to round, often retuse: erect or prostrate plants; leaves drying black below | d |
| c | { | Shrubby to 2 feet, leaves mostly 1 inch. | |
| | | | <i>p.</i> 104. <i>C. scabrella</i> . |
| | | Usually $\frac{1}{2}$ foot, leaves $\frac{1}{4}$ inch, narrow pod $\frac{3}{4}$ inch with stalk of one-sixteenth of an inch. | <i>p.</i> 104. <i>C. conferta</i> . |
| d | { | Small bushy plant: corolla two-thirds of calyx. | |
| | | | <i>p.</i> 103. <i>C. bourneæ</i> . |
| | | Stems prostrate, not much branched: corolla about equal to the calyx | <i>p.</i> 102. <i>C. ovalifolia</i> . |
| e | { | Branches very brown shaggy as also the calyx; leaves crowded | h |
| | | Branches not shaggy | g |

- | | | | |
|---|---|---|--|
| f | { | Racemes slender | <i>p.</i> 108. <i>C. barbata</i> . |
| | | Racemes contracted, 1 to 2 inches long and broad. | <i>p.</i> 107. <i>C. formosa</i> . |
| g | { | Racemes numerous in the upper leaf-axils forming large terminal panicles | <i>p.</i> 109. <i>C. madurensis</i> . |
| | | Racemes not paniced: leaves erect oblanceolate. | <i>p.</i> 106. <i>C. leschenaultii</i> . |
| h | { | Branches erect. Racemes simple, terminal. Leaves $\frac{3}{4}$ inch wedge-shaped | <i>p.</i> 105. <i>C. albida</i> . |
| | | Calyx very brown shaggy; two upper teeth overtopping the corolla. Rabbit's Ears | <i>p.</i> 105. <i>C. calycina</i> . |
| | | Calyx hairy or glabrous, not shaggy: leaves ovate: trailing herbs (<i>Pulneys only</i>) | <i>p.</i> 101. <i>C. fysoni</i> . |

Crotalaria fysoni *Dunn*; VIII 13*; Creeping Rattlepod: a small trailing plant with large yellow flowers bunched at the ends of the stems or branches.

Stems several from the perennial rootstock, 6 to 24 inches long, occasionally bifurcating, minutely ridged and usually downy, prostrate. Leaves all facing upwards, with pulvinus but hardly petioled, $\frac{3}{4}$ to $1\frac{1}{4}$ inches by $\frac{1}{2}$ to $\frac{7}{8}$ inch, mostly ovate; but the lower often smaller, $\frac{1}{4}$ inch and rounded to orbicular; acute mucronate or retuse; usually more or less downy by white hairs springing from persistent swollen bases which roughen the surface when the hairs have fallen: margin revolute: nerves raised underneath, obscure above. Racemes terminal; the stem entirely bare for 2 or 3 inches below them, ascending and carrying the four to six flowers up off the ground: bracts $\frac{1}{16}$ inch ovate acute or lanceolate, one-veined: pedicels $\frac{1}{4}$ inch: bracteoles minute or o. Calyx obscurely two-lipped, shaggy with white hairs; teeth lanceolate acute, $\frac{1}{4}$ to $\frac{1}{3}$ inch or three or four times the short tube; upper teeth slightly broader than the lower and connate for one-third their length. Corolla well exerted, up to 1 inch or more across: standard pure yellow veined reddish brown especially on the back, often reflexed: wings closely

adjacent and parallel, oblong obtuse, with the upper half or two-thirds of the outer surface drawn up as in other species into rows of minute cross ridges between the veins. Alternate stamens much longer than the others and their anthers twice as long. Style swollen and very hairy at the tip. Pod 1 to $1\frac{1}{4}$ by $\frac{1}{4}$ to $\frac{1}{3}$ inch, or three times the calyx, elliptic oblong or truncate, and broadest at the further end, usually downy, sometimes shaggy: seeds eight to ten. Varies much in hairiness, pods may be quite shaggy; and there is also a perfectly glabrous form. t. 74.

One of the commonest plants on the Kodaikanal downs where it sprawls by road-sides, over the edges of paths and cattle tracks or runs in the grass. Does not grow on the Nilgiris and till collected by Sir Alfred Bourne was unknown to the herbariums of Calcutta and Kew. Described recently by Dunn, in Kew Bulletin 1913. *Fyson* 276, 1072, 1846, 3013. *Bourne* 28, 57, 2038, 2513.*

NOTE ON THE SPECIES OF THE SECTION *alata*.

Till recently the only species of the section *alata* (with wing-stipules), described from South Indian mountains, were called *C. rubiginosa* and *C. scabrella* W. & A.; and the latter together with *C. wightiana* Wall. was included by Baker in the F.B.I. as varieties of the first. Finding it I had two other forms I sent them and what I supposed was *C. rubiginosa* Willd. *typica*, to Dr. Harms of Berlin for comparison with Willdenow's type plant in that herbarium. To my surprise and his, and indeed of every one who is interested in the plant, he found that Willdenow's plant is not an Indian one at all, for it is identical with *C. sagittalis* L., a North American plant, and the locality *Ind. Or.* on his sheet must therefore be incorrect. This mistake about the locality was undoubtedly the cause of the supposition that the well-known Indian plant is *C. rubiginosa* Willd. The Indian plant appears to me identical with Wallich's Cat. 5411, from Dindigul, under the name *C. ovalifolia*, though Wallich's leaves are smaller than one usually finds them. I have therefore taken that name, and have given a formal description in the Kew Bulletin. *C. sagittalis* L., to which Dr. Harms reduces Willdenow's *rubiginosa*, has smaller flowers and oblong or linear leaves and is quite distinct. *C. scabrella* W. & A. is separated as being quite distinct. See *Prain Journal As. Soc.*, Bengal.

Crotalaria ovalifolia Wall. Cat. 5411!; *C. rubiginosa typica* of F.B.I. ii 69, not of Willdenow; VIII 18-a. Rootstock perennial, 3 inches thick; branches weak, 6 to 12 inches, diffuse or more or less erect in herbage; all

green parts pubescent. Leaves nearly sessile, $\frac{1}{4}$ to 1 inch, elliptic to obovate or orbicular, obtuse or emarginate; when young clothed as are all the younger parts and veins underneath with soft grey or brown pubescence, at length glabrescent; upper sides drying black, lower with three or four pairs of prominent raised veins: stipules decurrent to the leaf next below or half-way only. Peduncles 2 to 3 inches, with one or two flowers, the lowest bract fertile: bracteoles $\frac{1}{8}$ inch, lanceolate-acute on the very short calyx tube. Calyx teeth $\frac{1}{3}$ to $\frac{3}{4}$ inch, hairy not silky. Corolla included or hardly exerted. Pod $1\frac{1}{4}$ by $\frac{1}{3}$ inch, sessile or practically so. t. 75. Wight Ic. t. 885.

In grass on the open downs. Nilgiris: on Snowdon 8,000 feet. *Fyson* 659. *Bourne* 4623. *Wight Herb. Prop.* Nos. 689, 690, 690-A; *Schmidt*; *Gärtner*. Pulneys: *Wight Kew. Dist. No.* 586 at *Kew*.

Gen. Dist. Dindigul Wall *Cat. No.* 5411; Mayaburan Sir F. Aagam.

Crotalaria bourneæ *Fyson No.* 1093; VIII 18.* Stems from the rootstock much forked, 4 to 6 inches, more or less erect, slender, pubescent. Leaves $\frac{3}{4}$ to $\frac{7}{8}$ by $\frac{1}{5}$ to $\frac{1}{4}$ inch, elliptic or oblong, obtuse or sub-acute at both ends, densely pubescent on both sides, drying black above: nerves three or four pairs raised underneath: stipules $\frac{1}{3}$ inch or less at the top, narrowing suddenly to a barely visible wing extending a little more than half-way to the next node. Peduncles $\frac{1}{2}$ to $\frac{3}{4}$ inch, leaf-opposed, one-flowered with a bract and aborted flower at about the middle. Calyx tube $\frac{1}{12}$ inch, with two linear-oblongate distinctly stalked bracteoles attached at the base; teeth $\frac{1}{2}$ inch. Petals included two-thirds of calyx. Pod 1 by $\frac{1}{8}$ inch, with stalk of $\frac{1}{10}$ inch. t. 76.

Pulneys. *Fyson* 1093, 2053, 2164. *Bourne* 401, a right-hand plant.

Allied to *C. ovalifolia* Wall., and like it leaves drying black above, but branches stiff though slender, and very much more bifurcating, leaves two or three times as long as broad, peduncles one-flowered, and corolla well included.

Crotalaria scabrella Wight and Arnott; *Wight Cat.* 692!; *F.B.I.* ii 69, as a var of *C. rubiginosa*; VIII 18. A sturdy bushy plant 1 to 2 feet, with hard and stiff branches; most variable as regards size of leaves and stipules in different parts of the same plant: older parts often black, with large persistent stipular wings 1 inch across, wider than the leaves. Leaves elliptic ovate or obovate, acute, mucronate, silky on both sides, or slightly scabrid above, from $1\frac{1}{2}$ by 1 inch on strong parts to $\frac{1}{4}$ by $\frac{1}{6}$ inch, on short lateral branches and then like *C. conferta*: nerves three to four pairs impressed on the upper side, raised on the lower. Peduncles 2 to 4 inches, two to four-flowered, attached about 1 inch below the opposing leaves: bracts $\frac{1}{4}$ inch lanceolate, ciliate, with distinctly swollen base; lower two or three empty: bracteoles on the calyx, $\frac{1}{5}$ inch, falcate lanceolate, acute. Calyx tube very short; lower teeth $\frac{2}{3}$ inch, upper nearly as long, divided half-way. Corolla scarcely exerted. Pod $1\frac{1}{4}$ by $\frac{2}{3}$ inch; seeds sixteen to twenty. t. 77.

Nilgiris and Pulneys: on the open downs on banks in long grass, etc. *Fyson* 521, 1083, 2070, 2114, 2715. *Bourne* 253, 514.

Very distinct from *C. ovalifolia* (*C. rubiginosa* of the F.B.I.); and from *C. wightiana*, distinguished by its smaller and much less variable leaves and by its shorter stalk to the smaller pod: and from *C. conferta* by its larger pod and larger habit altogether.

Crotalaria conferta *Fyson* No. 473; VIII 18; distinguished from *C. scabrellas* Wight and Arnott, by the uniformly smaller leaves, more distinctly stalked and shorter pod, and corolla exerted from the calyx. Branches from a rootstock, twiggy, 6 to 8 inches. Leaves $\frac{2}{3}$ to $\frac{1}{2}$ by $\frac{1}{12}$ to $\frac{1}{4}$ inch elliptic acute at both ends, silky pubescent and glossy on both sides, drying a rich shiny brown; nerves not conspicuous below: stipular wing $\frac{1}{3}$ inch at

the top, narrowing in a curve gradually to the next node. Peduncles $\frac{3}{4}$ inch, with one or more small bracts and aborted flowers. Calyx $\frac{1}{2}$ inch, very silky. Corolla larger. Pod $\frac{3}{4}$ by $\frac{1}{3}$ inch with stalk of $\frac{1}{15}$ inch.

Pulneys, on the downs above 7,000 feet in grass. *Fyson* 473. *Bourne* 410.

Crotalaria albida Heyne ; *Wallich Cat. No.* 5401, 2 and 3 ; *F.B.I.* ii 71, VIII 23. Branches numerous and slender from a short woody stem, forking low down but not branching above. Leaves subsessile, wedge-shaped, $\frac{1}{2}$ to $\frac{3}{4}$ by $\frac{1}{6}$ to $\frac{1}{5}$ inch, strongly one-nerved, with rounded end, covered on the under side with short hairs and small round translucent glands. No stipules. Flowers in long terminal racemes of eight to ten. Pedicels $\frac{1}{8}$ inch, calyx $\frac{1}{5}$ inch, hairy, two-lipped : the two upper lobes connate, and the three lower also connate, for about one-third. Bracteoles and the minute on the tube just below the parting of the lips. Corolla yellow : standard with green veins and a patch of silky hairs outside at the top, and with two scales at the base inside : wings a deeper yellow with a patch of cross-ridges. Style hairy. Pod quite glabrous. Seeds black and shiny with conspicuous radicle. t. 78.

Pulneys : Kodaikanal and below. *Fyson* 1847. *Bourne* 239, 257, 412.

Gen. Dist. Tropical regions India, Ceylon, Malay, China and the Phillipines.

Crotalaria calycina Schrenk ; *F.B.I.* ii 72, VIII 28 ; Rabbit's Ears ; distinguished from all other (high level) species growing near the ground, by the densely hairy calyx, whose upper lip stands up like two brown silky ears behind the pale yellow flower.

An annual from a few inches to 2 feet, the stem and branches flexuous, and clothed throughout with erect, appressed, coarse brown hairs, more numerous and

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An annual from a few inches to 2 feet, the stem and branches flexuous, and clothed throughout with erect, appressed, coarse brown hairs, more numerous and

shining on the younger parts, which give the whole plant a brown shaggy look. Leaves $\frac{1}{2}$ to 1 inch, by $\frac{1}{6}$ to $\frac{1}{5}$ inch, elliptic or oblanceolate, acute, sessile; densely hairy on the lower side. Flowers at the ends of leafy branches, not in distinct racemes; bracts and bracteoles $\frac{1}{4}$ inch, green; stalks $\frac{1}{5}$ inch. Calyx $\frac{3}{4}$ inch, very shaggy and brown, the two upper sepals $\frac{3}{8}$ inch wide, obtuse, united half-way, the two lower less than half as wide, free to the base and acute. Corolla glabrous, pale yellow, not exerted beyond the sepals; standard with long hairs down the middle line behind or near the blunt apex. Pod sessile $\frac{1}{2}$ inch, enclosed in the calyx, glabrous, dark brown, very turgid, and closely packed with twenty-five to thirty seeds whose rather long stalks enable them to lie in four-crowded rows [A.G.B.] .

Pulneys: common on the open grass land of the Kodai-kanal downs. *Fyson* 431, 2132. *Bourne* 125, 252, 1067.*

Gen. Dist. Widely over the tropics of the Old World, from Africa to South India, Ceylon and North Australia and on the Himalayas eastward into Burma

The plant appears to vary enormously according to locality. On the higher downs it is a dwarf (like *C. crinita* *Graham*) of 4 to 6 inches, with flat leaves one-fourth to three-fourth inch; or in long grass a tall plant with linear leaves, of over 1 inch, densely clothed with long hairs which meet along the midrib. *Fyson* 431. *Bourne* 1067.* Near Vilpatti *Fyson* 1083 (a few hundred feet below Kodaikanal) and lower down *Bourne* 877*, 458* it becomes a sturdy plant with elliptic acute leaves one and three fourth by half inch (*C. roxburghiana* DC.) and at still lower levels it becomes *C. amhyllordei* Don, with stem of 3 feet and more, and leaves 3 to 4 inches by half inch; but also a form with much narrower leaves like those of the tall grass form of the higher levels (*Bourne* 1067).

Crotalaria leschenaultii DC.; *Wall. Cat.* 5407; *F.B.I.* ii 76, VIII 42; a small bush with erect rather long and narrow wedge-shaped leaves and handsome spikes of large yellow flowers, and enormous pods frilled at the base by the dried calyx.

Branches ascending from a perennial rootstock, stout to $\frac{1}{4}$ inch, thick, striated not hairy. Stipules $\frac{1}{8}$ inch,

triangular recurved. Leaves sessile, 3 by 1 to 5 by $1\frac{1}{4}$ inches, oblanceolate-cuneate, green and glabrous above, clothed underneath with very regular short straight hairs; midrib prominent; lateral nerves straight nearly to the margin. Racemes terminal of sixteen to twenty flowers; bracts lanceolate acute; pedicels $\frac{1}{3}$ inch, without bracteoles. Calyx tube $\frac{1}{4}$ inch broad; three lower teeth $\frac{1}{4}$ inch by $\frac{1}{8}$ inch at the base; two upper $\frac{3}{8}$ by $\frac{1}{4}$ inch. Corolla handsome; standard 1 by $\frac{7}{8}$ inch, notched spreading backwards, yellow but eventually tinged at the base with brown wing petals forming a steep roof over the keel, fading a reddish terra-cotta; keel $\frac{1}{4}$ inch by $\frac{1}{4}$ inch, with $\frac{1}{8}$ inch point, fringed with white hairs, fading yellow; style eventually protruding. Pod when young horizontal, sharply bent at the apex; when ripe 2 by $\frac{1}{2}$ inch, rectangular on cylindrical with flat top, stalked and well exserted from the calyx which forms a conspicuous untidy cup at the base, and tipped by the stout persistent style.

Flowers on the Pulney downs in September the pods remaining till the following summer. Pulneys: on the open downs frequent on paths and clearings from 800 feet down as far at least as 5,500 feet. Nilgiris: (W. & A.). *Fyson* 416, 3014. *Bourne* 118, 675, 2996.

Gen. Dist. Not on the ghats to the north nor elsewhere in India or beyond. It might be said to be replaced on the plains by *C. retusa*.

Crotalaria formosa *Graham, Wall. Cat.* 5393!; *F.B.I.* ii 76, VIII 43; a shrub, distinguished by the tawny hairs of the stem and the very dense short thick racemes of large yellow flowers.

Stem dwarfed, much branched, covered with tawny hairs; stipules $\frac{1}{5}$ inch, narrow and curved downwards. Leaves 2 by 1 inch, obovate, narrowed to the short stalk, dark green above, silky below and brown with tawny hairs on the veins, mucronate; usually stiffly

shining on the younger parts, which give the whole plant a brown shaggy look. Leaves $\frac{1}{2}$ to 1 inch, by $\frac{1}{4}$ to $\frac{1}{5}$ inch, elliptic or oblanceolate, acute, sessile; densely hairy on the lower side. Flowers at the ends of leafy branches, not in distinct racemes; bracts and bracteoles $\frac{1}{4}$ inch, green; stalks $\frac{1}{5}$ inch. Calyx $\frac{3}{4}$ inch, very shaggy and brown, the two upper sepals $\frac{3}{8}$ inch wide, obtuse, united half-way, the two lower less than half as wide, free to the base and acute. Corolla glabrous, pale yellow, not exerted beyond the sepals; standard with long hairs down the middle line behind or near the blunt apex. Pod sessile $\frac{1}{2}$ inch, enclosed in the calyx, glabrous, dark brown, very turgid, and closely packed with twenty-five to thirty seeds whose rather long stalks enable them to lie in four-crowded rows [A.G.B.] .

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Branches ascending from a perennial rootstock, stout to $\frac{1}{4}$ inch, thick, striated not hairy. Stipules $\frac{1}{8}$ inch,

triangular, recurved. Leaves sessile, 3 by 1 to 5 by $1\frac{1}{4}$ inches, oblanceolate-cuneate, green and glabrous above, clothed underneath with very regular short straight hairs; midrib prominent; lateral nerves straight nearly to the margin. Racemes terminal of sixteen to twenty flowers; bracts lanceolate acute; pedicels $\frac{1}{3}$ inch, without bracteoles. Calyx tube $\frac{1}{4}$ inch broad; three lower teeth $\frac{1}{4}$ inch by $\frac{1}{8}$ inch at the base; two upper $\frac{3}{8}$ by $\frac{1}{4}$ inch. Corolla handsome; standard 1 by $\frac{7}{8}$ inch, notched spreading backwards, yellow but eventually tinged at the base with brown wing petals forming a steep roof over the keel, fading a reddish terra-cotta; keel $\frac{1}{4}$ inch by $\frac{1}{4}$ inch, with $\frac{1}{8}$ inch point, fringed with white hairs, fading yellow; style eventually protruding. Pod when young horizontal, sharply bent at the apex; when ripe 2 by $\frac{1}{2}$ inch, rectangular on cylindrical with flat top, stalked and well exserted from the calyx which forms a conspicuous untidy cup at the base, and tipped by the stout persistent style.

Flowers on the Pulney downs in September the pods remaining till the following summer. Pulneys: on the open downs frequent on paths and clearings from 800 feet down as far at least as 5,500 feet. Nilgiris: (W. & A.). *Fyson* 416, 3014. *Bourne* 118, 675, 2996.

Gen. Dist. Not on the ghats to the north nor elsewhere in India or beyond. It might be said to be replaced on the plains by *C. retusa*.

Crotalaria formosa *Graham, Wall. Cat.* 5393!; *F.B.I.* ii 76, VIII 43; a shrub, distinguished by the tawny hairs of the stem and the very dense short thick racemes of large yellow flowers.

Stem dwarfed, much branched, covered with tawny hairs; stipules $\frac{1}{5}$ inch, narrow and curved downwards. Leaves 2 by 1 inch, obovate, narrowed to the short stalk, dark green above, silky below and brown with tawny hairs on the veins, mucronate; usually stiffly

erect. Racemes 1 to 2 inches long and as broad pedicels short, densely silky. Calyx teeth $\frac{1}{4}$ to $\frac{3}{8}$ inch, four times the tube, shaggy, acute. Corolla not much longer, yellow, the standard veined brown. Pod distinctly stalked, at first black, afterwards green and finally straw-coloured, about $1\frac{1}{2}$ by $\frac{5}{8}$ inch, smooth and shiny, and frilled below by the dried calyx. t. 79. Wight Ic. t. 981.

Nilgiris : near Ootacamund on Snowdon, flower September to February, fruit March. In sholas and on the open downs near Pykara. Not known on the Pulneys. *Fyson* 3017.

The foliage is quite like *C. leschenaultii* DC. in which however the spikes are four or five times as long, and there are no tawny hairs.

Crotalaria barbata *Graham, Wall. Cat.* 5394!; *F.B.I* ii 76, VIII 44; a sturdy shrub with erect spikes of rich yellow flowers, conspicuous against the dark brown axis and pedicels; and with erect rather crowded leaves.

Branches thickly clothed with brown hairs. Leaves sessile (but pulvinus $\frac{1}{12}$ inch), erect, 2 to 4 inches, obovate with rounded base, clothed below with long white hairs, on the upper side nearly glabrous and glossy. Racemes terminal, 4 to 8 inches; bracts $\frac{1}{4}$ inch, pedicels $\frac{5}{8}$ inch, densely clothed with dark brown hairs. Calyx very distinctly two-lipped; tube $\frac{1}{4}$ inch; teeth $\frac{3}{4}$ inch, the two upper broader than the three lower, all clothed with brown silky hairs. Corolla a rich yellow; standard 1 inch across, notched. Pod erect green, quite glabrous, $1\frac{3}{4}$ by $\frac{3}{4}$ inch, widest at the upper end, surmounted by the $\frac{1}{4}$ inch stout style and at the base frilled by the dried calyx. t. 80. Wight Ic. t. 980.

Nilgiris : Near Ootacamund on the slopes of Snowdon 7,700 feet. Pykara 6,600 feet. Coonoor. *Fyson* 1985, 2710. Not collected on Pulneys.

Gen. Dist. Only on the South Indian mountains of Nilgiris and Travancore, not northwards on the Bombay Ghats.

***Crotalaria semperflorens* Vent. ; F.B.I. ii 78, VIII 50 ;** distinguished by its large ear-shaped stipules, broad oval green leaves, and magnificent spikes of yellow flowers. One of the commonest of road-side shrubs.

Shrubs or small tree, up to 10 feet ; branches striate : stipules up to $\frac{1}{2}$ inch, ear-shaped. Leaf-stalk $\frac{1}{3}$ inch, blade broadly ovate, 2 to 4 inches, conspicuously veined and densely pubescent on the under side, ultimately glabrous on the upper. Racemes terminal or opposite the leaves, naked for the lowest one-quarter ; bracts small, reflexed ; pedicels $\frac{1}{4}$ inch. Calyx-teeth $\frac{1}{3}$ inch, twice the broad tube, narrow. Corolla well exserted ; standard erect veined green. Pod oblong, turgid, $1\frac{1}{2}$ by $\frac{5}{8}$ inch, stalked above the persistent calyx. Seeds $\frac{1}{6}$ inch, brown, with very prominent radicle. t. 81. Wight Ic. t. 982.

By road-sides and the edges of sholas. Nilgiris : in Ootacamund itself very common. Pulneys on the downs above Kodai-kanal and down to Shembaganur. *Fyson* 489, 1923, 2207, 3015. *Bourne* 108, 169, 2884.

Gen. Dist. Tropical mountains of South India, Ceylon and Java.

A near ally of the common *C. verrucosa* L. of the plains, which however is but a herb and has blue flowers.

***Crotalaria madurensis* Wight in Wall. Cat. 53761 ; F.B.I. ii 79, VIII 56 ;** a small tree with light brown stem and very regular upward sloping branches ending in large panicles of pure yellow flowers. Tree 10 or 12 feet, branches sloping upwards with remarkable regularity and covered with white hairs, some simple others stellate. Petioles $\frac{1}{3}$ inch all pulvinus, without stipules. Leaves obovate cuneate, with a silky sheen on the upper and on the nerves of the lower side. Nerves about twelve pairs, curving slightly forwards at the ends and joined by others, all raised on the lower side and depressed on the upper. Flowers racemed on axillary branches of 4 to 10 inches, which are leafy for the greater part and so

form large leafy panicles 1 to 2 feet high by 6 to 8 inches wide: bracts boat-shaped $\frac{1}{3}$ inch, persistent till the standard has fallen; bracteoles similar. Calyx obscurely two-lipped; three lower teeth lanceolate, $\frac{1}{2}$ by $\frac{1}{6}$ inch at the base, two upper broader, ovate; all pubescent or silky with short white hairs. Corolla when closed not much exerted, but when open large and conspicuous; standard $1\frac{1}{8}$ by 1 inch, apiculate, thinly silky on the back: wings obliquely obovate-oblong, $\frac{3}{4}$ by $\frac{3}{8}$ inch; all three petals alike in colour a light yellow without any red in it: keel $\frac{1}{2}$ inch at the broadest part, its tip $\frac{1}{8}$ inch light green. Pod $1\frac{1}{4}$ by $1\frac{1}{2}$ inches deep by $\frac{3}{4}$ inch broad, somewhat flattened above and below; when young thinly canescent, when ripe frilled by the brown but not much shrunken sepals. t. 82. (*Fyson* 3016.)

Pulneys: on the open downs, flowering July to September, and then a magnificent sight, especially on the hill side to the left of the Poombari road two miles beyond the Observatory, and below the new ghat road a little above Shembaganur. *Fyson* 2157, 3016. *Bourne* 866, 507, 2883. Nilgiris: Coonoor *Clarke*, *Wight*, *Gough*. Nowhere else.

TRIFOLIUM.

F.B.I. 50 X.

Clover.

A genus of the temperate regions occurring here only as introduced weeds. Small herbs. Leaf-stalks with stipules adhering to them and at the base encircling the stem; leaflets three, finely toothed. Flowers in close heads (short spikes), red, yellow, or white, not blue. Petals persistent, enclosing the small pod, keel obtuse.

Species about 200, mostly in Europe and Asia.

Trifolium was the Latin name for the common clover.

Petioles under an inch; flower-heads $\frac{1}{4}$ inch yellow. T. minus.
 Petioles more than an inch; flower-heads white, $\frac{3}{4}$ inch. . .

White Clover T. repens.

Trifolium repens *Linn.*; *F.B.I.* ii 86, X 2; White or Dutch Clover. Stem creeping and rooting at the nodes. Internodes usually quite short; stipules large up to $\frac{3}{4}$ inch, thin, free part not widened, scarious, often purplish; petioles short $\frac{3}{4}$ to $1\frac{1}{2}$ inches, leaflets obcordate, finely toothed on the rounded end, all sessile or nearly so. Peduncles axillary, 2 to 6 inches, angled or grooved. Heads $\frac{3}{4}$ inch across, flowers distinctly pedicelled, reflexed when over. Calyx teeth slender, not longer than the tube. Standard petal distinctly striate when faded. Pod oblong, $\frac{1}{5}$ by $\frac{1}{16}$ inch, longer than the calyx but enclosed in the persistent corolla, indented between the seeds. Seed white, heart-shaped.

Nilgiris: Pykara flowering in May after the first rains. An introduction from Europe. *Fyson* 2211, 2931.

Trifolium minus *Smith*; *F.B.I.* ii 86, X 3*. Stems very slender prostrate. Leaves nearly sessile: leaflets rounded and finely toothed at the apex, wedge-shaped at the base, about $\frac{1}{4}$ inch long; the middle one shortly stalked; stipules broad and pointed, $\frac{1}{8}$ by $\frac{1}{12}$ inch. Peduncles in the axils of the leaves, $\frac{1}{2}$ inch, very slender; heads $\frac{1}{4}$ inch across. Flowers yellow, the standard marked after fading with longitudinal lines. Capsule with one seed.

An introduced weed, native of Europe; closely allied to the Hop-trefoil, *T. procumbens* of England. *Fyson* 2033.

PAROCHETUS.

F.B.I. 50 XI.

A genus of one species only.

Parochetus communis *Hamilton*; *F.B.I.* ii 86, XI 1; the Blue Parochet; a small creeping plant with Clover or Sorrel-like leaves, and blue and white flowers solitary or in pairs on slender stalks.

Stem or rhizome very slender, running to 2 or 3 feet, and rooting at the nodes. Leaf-stalks $\frac{1}{4}$ inch: leaflets

three, $\frac{1}{2}$ inch long, all sessile, obcordate or obovate cuneate, notched, glabrous on the upper, sparingly pubescent with coarse hairs on the under side and round the margin: stipules acute. Peduncles longer than the leaf-stalks, usually one, but occasionally two-flowered, with a pair of small bracteoles $\frac{1}{2}$ inch below the flower. Calyx companulate of four-lobes (by union of the two upper teeth as shown by a small notch in the upper lobe) lowest tooth much the largest. Standard petal reflexed, blue, obovate with a short claw: keel abruptly inflexed, narrow, white. Style glabrous: stigma capitate, eventually exserted beyond the keel. Pedicels after flowering reflexed. Pod $\frac{3}{4}$ by $\frac{1}{8}$ inch, straight, opening by both margins. Seeds seven or more, ovate with hilum notch in the middle of one side. t. 83. Wight Ic. 483.

Very common on damp ground, in the open and round the edges of sholas; in and near Ootacamund and on the Kodai-kanal downs. Not at much lower levels nor on the ghats to the north. *Fyson 1909. Bourne 596.*

Distributed widely over the higher mountains of tropical Asia, the Himalayas from Sinla to Assam, the mountains of Burma, Java, etc.; and of Africa and Zambesi land. The only species of its genus.

Named from the Greek OCHETOS, a drain, conduit or river-bed, because found in damp places. [C.F.S.]

INDIGOFERA.

F.B.I. 50 XVII.

Indigo, etc.

A large tropical genus distinguished by a more or less dense covering of white hairs closely appressed to the surface and attached by the middle not at one end by minute points at the top of the anthers; and by a continuous not jointed pod containing usually several seeds. Leaves in the majority of species pinnate (in one of ours three-foliate). Corolla generally pink and quickly falling; keel petals with a spur on the outer side near the base. Stamens diadelphous.

Nearly 300 species, scattered over all the warmer parts of the world, but more especially South Africa.

India alone has over 40 species, most of them growing on the plains. Indigo, by far the most important of blue dyes, was, until the last decade or two, obtained exclusively in India from the cultivated *I. tinctoria* and *I. erecta*, by fermentation of the stalks and leaves. Hence Latin name *indicum* for the colour and hence also *indigo fero* (*fero* = I bear).

Small trailing plant with young parts almost black, three-foliate leaves and bright red flowers *I. pedicellata*.

Shrub with pinnate leaves and racemes of pink flowers
I. pulchella.

***Indigofera pedicellata* Wight and Arnott ; Wight Cat. 8681 ; F.B.I. ii 95, XVII 15.** Rootstock perennial ; branches very slender, wiry, black-pubescent on the younger parts, trailing on the ground but not rooting. Petioles $\frac{1}{6}$ to $\frac{1}{4}$ inch ; leaflets three, in the larger form occasionally four, $\frac{1}{6}$ to $\frac{1}{2}$ inch long, elliptic obtuse, covered with black glands. Flowers crowded six to twelve, in short corymbs : pedicels $\frac{1}{6}$ inch : bracts linear $\frac{1}{16}$ inch. Calyx $\frac{1}{12}$ inch with long teeth. Corolla red. Pod $\frac{3}{4}$ inch straight, even, sharply pointed. t. 84. Wight Sp. Nilg. t. 56.

Very common especially on gravel paths and exposed spots. Pulneys near Kodaikanal. Nilgiris. *Fyson* 687, 1844. *Bourne* 61, 255.

In general habit this species is not unlike the very common *I. cuneaphylla* L. of the plains, but differs in its three-foliate leaves and less crowded flowers. The floral mechanism to secure pollination by insects is also very similar. See Pres. Coll. Bot. Bull. No. 11.

There appear to be two forms distinct enough perhaps to be called varieties. In the smaller the leaflets are not more than one-third by one-eighth inch and very black below like the young branches, and the flowers one-fourth inch bright red. In the larger the leaflets are not less than half by one-fourth inch when fully expanded, there is much less black on them and on the branches, and the flowers are considerably larger, about half inch and pink rather than red. It is as if the same quantity of black and of red colour were distributed over larger areas. This larger form is the type of Wight and Arnott's species. Wight Cat. 868.

***Indigofera pulchella* Roxburgh ; F.B.I. ii 101, XVII 37.** Shrub, 4 to 6 feet with trunk up to 4 inches thick at the

base and slender branches. Leaves 2 to 4 inches, of eleven to fifteen leaflets. Leaflets distinctly stalked, $\frac{3}{4}$ to 1 by $\frac{1}{3}$ to $\frac{1}{2}$ inch, elliptic or oblong-obovate, mucronate, dark green on the upper side, covered on both sides with very regularly arranged closely appressed hairs. Racemes 1 to 5 inches: pedicels very short. Corolla $\frac{1}{2}$ inch: standard petal reflexed. Pod straight 1 to $1\frac{1}{8}$ by $\frac{1}{6}$ inch, sharply pointed, glabrous. Seeds $1/16$ inch. Wight Ic. t. 367.

On the open downs. Pulneys: common above Kodaikanal. Nilgiris. *Fyson* 2239. *Bourne* 99, 994.

Gen. Dist. Himalayas and other Indian hills above 5,000 feet, Kanara and the Ghats to the north of us, Mableswhar, etc.

PSORALEA.

F.B.I. 50 XVIII.

Shrubs with odd-pinnate gland-dotted leaves and indehiscent one-seeded pods.

Species about 100 mainly in South Africa and North America.

Psoralea pinnata; XVIII 3; a shrub of 2 to 6 feet, with numerous branches sloping steeply upwards and close set leaves of about seven narrow, linear, pointed leaflets. Flowers towards the ends of the branches, blue. t. 85.

Near Ootacamund on the bank of the deep cutting through which the road to Coonoor passes near the old aqueduct, and by the toll-gate. An introduction. Not recorded from anywhere else in South India. The species however has not been determined with any certainty.

DESMODIUM.

F.B.I. 50 L.

A large tropical genus, characterised by the pods being composed of a number of flat one-seeded segments; the leaflets three, each with a pair of stipels; and the flowers in terminal racemes, blue or pink or a mixture

of these colours, never yellow. The middle leaflet is usually the largest and has a longer stalk.

Species about 120, cosmopolitan in the tropics.

Named from the Greek DESMOS, a chain, because of the jointed pod.

Shrub ; leaves 2 inches, racemes 2 to 4 inches, erect, blue . . .

D. rufescens.

Twiggy plant ; leaflets 1 to 3 inches across ; flowers few, red.

D. scalpe.

Very thin stemmed twiggy plant ; leaves not above $\frac{1}{2}$ inch,
flowers blue or pinkish in very slender racemes

D. parviflora.

Desmodium rufescens DC. ; *F.B.I.* ii 171, L 37.

A shrub, the slender branches, stipules, leaf-stalks and veins of the underside, densely clothed with reddish brown hairs. Leaf-stalks 1 inch ; stipels linear, $\frac{1}{8}$ inch ; leaflets obovate, cuneate at the base or rounded at both ends, mucronate, the upper side covered when young with a very fine pile of short grey hairs but glabrous when older, the under side covered with white silk.* Racemes 3 to 6 inches, occasionally axillary, more densely flowered in the upper part. Pedicel $\frac{1}{3}$ inch, and calyx densely hairy. Corolla $\frac{1}{2}$ inch. Staminal tube $\frac{3}{8}$ inch, slender, appearing often outside the keel ; anthers obtuse, style abruptly bent, without hairs. Pod 1 by $\frac{1}{8}$ inch, nearly straight on the upper edge, indented by the five to seven divisions along the lower, downy. Remarkable for its very silky-brown buds and young leaves. Wight Ic. t. 984, Ill. t. 79.

Very common in thickets on the Pulney and the Nilgiri downs ; flowers summer. Kodaikanal, Ootacamund, Coonoor, Kotagiri, Pykara and lower levels, but not on the ghats to the north. *Fyson* 298, 387, 532, 3019. *Bourne* 101, 121.

Gen. Dist. Also Ceylon where plants are less thickly covered but hairs long.

Desmodium scalpe DC. ; *F.B.I.* ii 165, L 16. Stem woody, slender, young parts pubescent. Stipules $\frac{1}{4}$ to $\frac{1}{2}$

* De Candolle Prod. ii 335 "pubescent."

inch, lanceolate acuminate, glabrous except on the margin, closely appressed to the stem. Leaf-stalk 2 inches hairy. Leaflets three, 1 to 3 inches wide; the middle one rhomboid; lateral oblique; stalks $\frac{1}{4}$ inch. Flowers small in lax terminal racemes or panicles, up to 12 inches. Bracts deciduous; pedicels very slender, usually in pairs, sloping up. Calyx $\frac{1}{8}$ inch. Corolla $\frac{1}{3}$ to $\frac{1}{2}$ inch, red. Pod of one to three half-diamond-shape joints, $\frac{1}{4}$ to $\frac{1}{3}$ inch long, with upper suture slightly curved. t. 86. Wight Ic. 985.

Nilgiris: near Ootacamund. Pulney at lower levels. *Fyson* 3018. *Bourne* 157.

Gen. Dist. Usually at lower levels on the hills of South India. Also tropical Africa, Abyssinia, Natal, Mascarene islands. Varies to a certain extent, leaflets acute or blunt, with entire or sinuate-crenate margin.

***Desmodium parvifolium* DC.; Wall. Cat. 5700!; F.B.I. ii 174, L 47.** Stems (main branches) pubescent in the younger parts, glabrous and often red in the older, 1 to 20 inches thick. Lateral branches numerous, sticking out stiffly at right angles, leafy from the base to the flowering part. Stipules finely pointed, up to $\frac{1}{3}$ inch hairy, persistent after the leaf has fallen, e.g. at the base of a branch. Leaves reflexed close to the axis, of one or pinnately of three leaflets: leaflets, ovate, obtuse mucronate, with reticulate translucent veins; the terminal largest, $\frac{1}{8}$ to $\frac{1}{3}$ inch long; the lateral smaller: stalks not longer than the stipules. Racemes terminating the lateral branches, slender as a hair, pubescent: bracts ovate, boat-shaped deciduous; pedicels up to $\frac{1}{2}$ inch. Sepals $\frac{1}{10}$ to $\frac{1}{8}$ inch, slender pubescent, the calyx tube a quarter as long. Corolla blue, pale, purple or pinkish, not much exerted; keel rounded. Fruits on slender erect stalks $\frac{1}{2}$ by $\frac{1}{8}$ inch, three to five jointed by indentations on both edges; the joints opening on the top edge only, obscurely reticulately veined, pubescent, with the calyx persistent at the base. t. 87.

Quite common on the higher downs in grass and still more so at lower levels. Flowers March to October. *Fyson* 2134.

Gen. Dist. 'India on the hills : Simla, Nepal 4 to 6,000 feet ; Khasia 3 to 5,000 feet ; Nilgiris, Pulneys 7,000 feet ; Ceylon, not in the Bombay presidency [C.B.F.]; Java and New Guinea 6,000 feet. The " Everywhere in the plains " of F.B.I. Ic. appears to be incorrect.

VICIA.

F.B.I. 50 LIII.

Vetch.

Slender stemmed herbs with pinnate leaf, part of which is transformed into a branched tendril by which the plant climbs: stamens diadelphous oblique at the mouth: pod dehiscent not jointed.

A large genus of 100 species scattered widely over the north temperate regions and also in South America. England has nine species.

Vicia sativa *Linn.*; *F.B.I.* ii 178, LIII 9; common Vetch; a slender stemmed herb, climbing by branched tendrils, and having reddish or bluish purple flowers, solitary or in pairs at the leaf-axils. Stipules rather large and coarsely toothed, leaflets four or more pairs in each leaf, less than an inch in length variable in shape but usually oblong, narrowed to the base and cut off abruptly at the apex or indented, with a conspicuous mucro, otherwise entire. Flower stalk $\frac{1}{4}$ inch. Calyx tube campanulate: teeth as long, slender, sub-equal. Corolla well exerted, $\frac{3}{4}$ to 1 inch across: petals narrow. Pod $1\frac{3}{4}$ inches by $\frac{1}{6}$ inch straight, pointed: seeds seven to ten globular. t. 88.

An introduction from Europe, where it is cultivated for forage and so has spread widely over the temperate parts of the world; *Fr.* Vesce cultive, *Ger.* Futterwicke. *Bourne* 4662.

The flower has a simple pistol mechanism for the presentation of pollen to insect visitors. The anthers open inside the keel and shed their pollen into its tip. When a fairly heavy insect, such as a bee alights on the flower it depresses the keel and in consequence pollen is pushed out of the end by the hairs on the style. In older flowers the stigma hits the insect's body in the same place and being receptive takes pollen from it.

The name is an old Latin one.

DUMASIA.

F.B.I. 50 LVII.

Slender-stemmed twining plants with pinnately three-foliate leaves distinguished by the calyx with bulging base and oblique truncate mouth (hardly any teeth); the standard petal with two spurs at the base; the style long and flattened above the curve, and with capitate stigma.

Species three only, India, South Africa, Malaya and Japan.

Dumasia villosa : *F.B.I.* ii 183, LVII 1; a climber with pinnately three-foliate leaves; short racemes of flowers with long and almost toothless calyx out of which pokes the yellow corolla; and velvety pod contracted between the seeds.

Stem slender, twining, thickly coated, as also the stipules, leaf-stalks, undersides of leaflets, calyx and pod with short yellowish hairs. Stipules $\frac{1}{6}$ inch acute; petiole 1 to 2 inches. Leaflets nearly equal, ovate, obtuse, mucronate, glabrous above, when young ciliate: middle stalk $\frac{1}{2}$ inch, lateral $\frac{1}{8}$ inch. Racemes 2 to 4 inches, few flowered: peduncle slender, 2 inches or more, in *var congesta* very much shorter. Calyx $\frac{1}{3}$ inch bulging forwards at the base and narrowed to the very oblique mouth. Corolla exserted $\frac{1}{2}$ to $\frac{3}{4}$ inch, hanging with the small round standard downwards: wings obovate, curved downwards, adhering slightly to the keel which is shorter, and has a slender claw longer than the oval blade. Style thickened suddenly at the bend, then thinner: stigma with radiating hairs. Pod enclosed at the narrow base by the calyx, contracted between the few seeds very velvety, opening by both edges. Wight *lc.* t. 445.

Quite common in sholas on the Octacamund and the Kodai-kanal downs. *Fyson* 528, 693. *Bourne* 849,* 204.

Gen. Dist. Western Ghats, but not common to the immediate north. (In the Bombay presidency rare, only found by Cooke and at Mableswhar [C.B.F.]

Ceylon, Himalayas from Simla to Khasia and eastwards to Java, also in Madagascar and Natal.

PHASEOLUS. F.B.I. 50 LXXIII.

Bean.

Twining plants with pinnately three-foliate leaves and axillary racemes of flowers characterised and distinguished by the keel being very long and coiled in a spiral; the style also long and conspicuously bearded below the stigma; and the pod long and narrow.

Species about 60, some widely cultivated, e.g., the French, Kidney and Haricot bean.

Phaseolus trinervius Heyne; *Wall. Cat.* 5603!; *F.B.I.* ii 203, LXXIII 12; stem and leaves hairy. Stipules ovate acute, attached above their base. Leaves $\frac{1}{2}$ to $2\frac{1}{2}$ inches, ovate, more or less lobed. Stalks of racemes 3 to 6 inches; flowering part 1 to $1\frac{1}{2}$ inches. Corolla yellow or reddish. Pod at first very silky, 2 to $2\frac{1}{2}$ inches long, ten to twelve seeded, slightly curved.

A native of lower levels but found near Kodaikanal. *Fyson* 433, 1120. *Bourne* 2004.

Gen. Dist. Plains of South India, Ceylon and Malaya.

ATYLOSIA. F.B.I. 50 LXXIX.

Herbs or shrubs, erect or twining with pinnately three-foliate leaves; characterised by the flowers in pairs; all parts covered with small red resinous glands which however are concealed under short hairs; pods with depressed lines between the seeds; and the strophiole (aril) of the seeds large and divided.

Species about 20, India, Mauritius and to Australia.

Named from the Greek α without and TYLOS, callosity, because the standard is without the hard basal knobs possessed by some genera.

Shrub 2 feet. *A. candollei*.
Slender twiner running in grass. *A. rugosa*.

Atylosia candollei Wight and Arnott; *Herb. Wight Prop.* 1631!; *F.B.I.* ii 212, LXXIX 1. Branches, leaf-stalks, undersides of leaflets, calyx, and more especially in the younger parts densely clothed with erect hairs: twigs stiff. Stem grooved, very hairy on the ridges between. Leaf-stalk $\frac{1}{2}$ inch erect: internodes hardly longer so that the foliage is usually very dense. Leaflets elliptic or obovate-cuneate, 1 to $3\frac{1}{2}$ inches by $\frac{1}{2}$ to 1 inch; lateral somewhat oblique; terminal slightly larger; stalks about equal; pubescent on the upper side, densely so on the raised veins of the lower; distinctly sticky. Peduncles of the pairs of flowers erect, in the lower axils 2 inches, in the upper short to 0: pedicels $\frac{1}{2}$ inch. Calyx $\frac{1}{2}$ to $\frac{3}{4}$ inch densely silky, teeth two to three times the cup. Petals as long again, pure gamboge yellow: keel blunt without beak. Stamens all equal, upper one free. Pod very hairy, $1\frac{1}{4}$ by $\frac{3}{8}$ inch, with a short abrupt point, surrounded at the base by the persistent calyx and corolla, and slightly indented between the three or four seeds. t. 89. Wight Ic. 754.

Nilgiris: Ootacamund, Snowdon, etc., flowering July. *Fyson* 2681. *Bourne* 4627.

Gen. Dist. Also Ceylon.

The flowers face upwards with the keel erect and standard horizontal. The standard is bent back near its base, and there presses against two small points on the wing petals. These latter are attached to the keel. Honey can be got only by a stout proboscis pushed home between the standard and the wings. But the standard stiffened at this point by being bent, and supported also by the calyx behind it, remains firm, so that the wings and with them the keel petals are pushed apart exposing the stamens.

The flowers have the smell of musk, the leaves a little that of the "Cedar-wood" of pencils. The petals fade a rich purple-terracotta colour beginning with the back of the standard.

Atylosia rugosa Wight and Arnott; *Herb. Wight Prop.* 761!; *F.B.I.* ii 215, LXXIX 12; remarkable for its very slender stems running in grass and the very conspicuous veins of the underside of the small leaflets. Leaf-stalks $\frac{1}{2}$ to 1 inch, erect, clothed like the young

branches with brown pubescence. Leaflets $\frac{3}{4}$ inch ; terminal one obovate cuneate, lateral obliquely obovate ; velvety on the upper side with impressed veins ; white or almost orange below especially on the much-raised veins. Peduncles $\frac{1}{4}$ to $1\frac{1}{2}$ inches, $\frac{3}{4}$ to 1 inch apart along leafless branches : pedicels $\frac{1}{8}$ inch, bracts conspicuous, $\frac{1}{6}$ inch ovate. Calyx $\frac{1}{8}$ inch, teeth equal to the tube. Corolla $\frac{1}{4}$ inch, yellow ; remaining for some considerable time, but not quite until the pod has ripened. Pod $\frac{1}{2}$ inch by $\frac{1}{8}$ inch, rounded at both ends except for the short styler point, mostly one-seeded but also with two or three seeds, densely pubescent, brown, opening by both edges, the valve curling up when dry : if with two seeds divided inside between them. Seeds brown or purple, with a large double fleshy excrescence (strophile) on the hilum side, more than half as long as the seed itself.

Pulneys : on the Kodaikanal downs, very common. Nilgiris : near Ootacamund, much less common. *Fyson* 1089, 1099, 1488. *Bourne* 1091, 2040.

Gen. Dist. South Indian hills and Ceylon. Not on the Bombay Ghats to the north, nor apparently anywhere else in India.

The leaflets show very marked sleep-movements, folding along the midrib, and becoming nearly erect against the stalk at sundown. I have not detected any scent as in the other species.

FLEMINGIA. F.B.I. 50 LXXXV.

Leaflets three, gland-dotted below and equally stalked. Flowers in dense spikes or clover-like heads, stipules and bracts large and conspicuously striate. Pods not divided between the seeds, and seeds without strophiole.

Species about fifteen, nearly all Indian.

Erect herb or under shrub, leaflets up to 3 inches.

F. *grahamiana*.

Trailing herb, leaflets $\frac{3}{4}$ inch. F. *procumbens*.

Flemingia grahamiana *Wight and Arnott ; Wight Herb. Prop. ! ; F.B.I. ii 228, LXXXV 6.*

Shrubby, stem erect, finely striate; young parts tomentose. Stipules $\frac{1}{3}$ inch by $\frac{1}{8}$ inch acute, very closely striate, persistent. Petioles 1 inch with narrow wing, when young closely erect against the stem. Terminal leaflet 2 to $3\frac{1}{2}$ inches by 1 to $2\frac{1}{2}$ inches, obovate cuneate, with three main veins, the middle one pinnately branched, the lateral one more closely so on their insides than on the outsides, recalling the venation of ZIZYPHUS; lateral leaflets oblique, venation similar but inside lateral vein absent or not well marked; all acute entire, equally and shortly stalked, sparingly pubescent on the upper side, hairy on the veins on the lower, and dotted with glands; when in bud erect, folded between the shaggy veins, then horizontal, later hanging perpendicular from erect petioles, then rising as they unfold and the petioles spread outwards. Spikes very dense, oblong, 1 to 2 inches; bracts $\frac{1}{4}$ inch, finely striate, ciliate, acute. Calyx teeth hairy round the edges, sprinkled with black glands. Corolla small, not exserted. Pod short and stout, under $\frac{1}{2}$ inch by $\frac{1}{4}$ inch, finely pubescent and covered with clammy red glands.

Pulneys: on the Kodaikanal downs, extremely common, where in summer the young shoots are conspicuous above the herbage, for their horizontal folded leaves. Flowers October and November. *Fyson* 1129, 2151. *Bourne* 45, 402.

Nilgiris: Coonoor. Not elsewhere.

Flemingia procumbens var *nilgheriensis* *Wight* manuscript in *Herb. Kew*; *F.B.I.* ii 230 LXXXV 10.* Stem and branches many, 12 to 18 inches, spreading on the ground, terete, clothed as also the leaf-stalks and calyx with long spreading hairs and sprinkled with dark red glands. Stipules $\frac{1}{3}$ inch to $\frac{1}{2}$ inch by $\frac{3}{16}$ inch acute, finely striate, hairy. Petioles $\frac{1}{4}$ inch to $\frac{5}{8}$ inch, leaflets equally subsessile, rounded at the end, mucronate,

pinnately veined, middle one obovate, cuneate, lateral more oblong and oblique. Heads of flowers terminal about $\frac{3}{4}$ inch across, peduncled $\frac{1}{2}$ to $1\frac{1}{2}$ inches above the last leaf, but often with a pair of stipule-like bracts $\frac{1}{6}$ inch below; bracts $\frac{1}{3}$ by $\frac{1}{10}$ inch lanceolate acute, hairy. Calyx densely hairy, the hairs often springing from large yellowish bulbous bases, and with also small dark red glands; teeth more than twice the tube, linear lanceolate, shaggy especially round the edges. Pod not much exserted, purple, standard hairy and glandular on the back, auricled. Pods $\frac{1}{5}$ inch shorter than the calyx, ovoid or sub-globose, pointed, glabrous, veined; seed one only as a rule, ellipsoid, quite filling the pod, dark brown, smooth. Wight Ic. 987.

"Lidcot valley near Kodaikanal on rocks." *Bourne* 893. On the Nilgiris at Pykara, flowering September. Confined to the Western Ghats but rare in the Bombay presidency.

In the F.B.I. this is placed as a variety of *F. vestita*, *Benth.* apparently because named by *Wight* *F. procumbens* by a slip which he corrected in a manuscript in the herbarium at Kew while *F. procumbens Roxb.* = *F. vestita Benth.* The plant is restored to specific rank by Cooke in the Bombay flora, from which this explanation and the description of the pod is taken.

SOPHORA.

F.B.I. 50 XCII.

Shrubs with pinnate leaves, very small calyx teeth, stamens all free (an unusual thing in this family), and the pod constricted between the seeds and usually not opening.

Sophora glauca *Leschenault*; *F.B.I.* ii 249, XCII 4. Height 6 to 12 feet; branchlets terete, densely pubescent. Leaflets ten to fifteen pairs plus a terminal one, $\frac{1}{2}$ by $\frac{1}{5}$ inch, oblong, obovate-elliptic, blue-green or olive-green, softly hairy on both sides, with strong midrib produced as a mucro. Flowers in dense terminal racemes with small and very quickly falling linear bracts and bracteoles. Calyx $\frac{1}{4}$ inch long and broad, with small but distinct teeth, pinkish purple: pedicels

shorter, densely silky, erect. Corolla twice as long, petals with long claws, equal: standard obovate, $\frac{1}{4}$ inch broad, notched: wings oblong: keel petals overlapping at the back but scarcely united. Pod cylindrical with a stalk of $\frac{1}{4}$ to 1 inch and equally long point, constricted between the seeds which if few may be far apart, very densely velvety. Seeds one to six, almost perfectly ovoid except for a swelling near the small hilum, polished, light coloured. t. 90. Wight Ic. 1054 ex. pods.

On the open downs. Nilgiris: near Ootacamund in flower all the year round, and down to Pykara, Kotagiri and Coonoor. *Fyson* 679, 1784, 2239, 2723. *Bourne* 4592, 4020. Not collected on Pulneys.

Gen. Dist. Shevaroy's, the hills of Western India, but apparently somewhat local, and not on the ghats of the Bombay presidency.

The leaves have a rank smell when bruised, somewhat like that of the English Elder, and on drying turn black. The flower is much compressed, the standard being folded round at the base and leaving a small tubular opening above the upper edge of the keel and wings. Partly because of this folding but also of its thickness, the standard is very stiff, and is made more so by the support of the upper calyx lobe. The keel and wings are free of each other but small projections at the base of the latter fit into hollows in the wings so that they must move together. A heavy insect pushing its way down the tubular opening between the firm standard and the wing petals would necessarily force the latter down and with them the keel and so come into contact with the anthers, held in place as these are by their stiff filaments. The flower thus appears adapted for visits by short-tongued bees.

CÆSALPINEÆ.

In this family (or sub-order) of the LEGUMINOSÆ the petals are nearly equal and similar, the uppermost is inside the others in bud and often much the smallest, the stamens are all free of each other, and typically ten but often reduced to seven or fewer. In other respects it is as given under LEGUMINOSÆ p. 93.

CASSIA.

F.B.I. 50 CIII.

Herbs, shrubs and trees. Leaves even-pinnate, with one or more glands on the rachis. Flowers usually

yellow and showy ; sepals five, on the margin of a short and scarcely hollowed calyx-tube ; stamens ten, but often only seven of the anthers fertile, some at least of these opening by pores or short slits.

A large genus of 300 to 360 species, inhabitants of all tropical countries, and divisible into four well-marked subgenera, according to the number and dehiscence of the fertile anthers, the nature of the pod and the lie of the seeds in it, the general habit and the arrangement of the flowers.

Monographed by G. Bentham in *Trans : Linn ; Soc : Vol. xxvii.* (1871).

- | | | | |
|---|---|---|-------------------------|
| a | { | Leaflets thirty to forty pairs : a small spreading undershrub | <i>C. mimosoides.</i> |
| | | Leaflets three to ten pairs : shrubs or trees | b. |
| b | { | Glands on the leaf-stalk between all or most of the leaflets | c. |
| | | One gland only at the base of the leaf-stalk. | <i>C. occidentalis.</i> |
| c | { | Leaflets glabrous | <i>C. lævigata.</i> |
| | | Leaflets tomentose underneath | <i>C. tomentosa.</i> |

***Cassia occidentalis* Linn.;** *F.B.I.* ii 262, CIII 5 ; a low undershrub with foliage and inflorescence of *C. lævigata* except for the solitary gland on the leaf-stalk near its base, and pod when ripe flat, 4 inches by $\frac{1}{4}$ inch with prominent sutures thicker than the rest of the pod. Seeds flattened at right angles to the pod and parallel to the division walls, except sometimes in the upper part of the pod they are parallel to the sides.

A native probably of tropical America and introduced elsewhere. Now abundant in waste and cultivated places in tropical Asia and Africa.

***Cassia lævigata* Willd ;** CIII 7. A handsome shrub with golden yellow flowers in terminal corymbs of axillary racemes, distinguished by the acute or acuminate dark green glabrous leaflets, with a cylindrical pointed gland between the two of every or all but the terminal pair. Branches round, smooth. Stipules $\frac{1}{4}$ inch but often falling early. Leaves from 4 to 8 inches, the lowest

pair of leaflets $1\frac{1}{2}$ to 2 inches from the branch. Leaflets variable, the terminal pair usually the largest, from 1 to 5 inches along and from $\frac{1}{5}$ to $\frac{1}{2}$ as broad. Flowers over an inch across. Three upper stamens, sterile, next four with anthers $\frac{1}{8}$ inch, the next pair with filaments longer than the lowest one and anthers, like the latter, $\frac{1}{4}$ inch curved; all these opening by pores at the top, and having a line of pubescence down the middle line on each side, which however soon withers. Pod brown, $3\frac{1}{2}$ to $\frac{1}{3}$ inch, thick, opening elastically along one edge, segmented inside and indented between the seeds. Seeds horizontal with short stalks. t. 91.

A native of tropical America, Brazil to Mexico, and now wild, but probably introduced, in similar parts of Asia and Africa.

Cassia tomentosa Linn.; *F.B.I.* ii 263, CIII 7; the Yellow Cassia of Ootacamund. A small tree or shrub, with large panicles of buttercup-yellow flowers, making sheets of colour. Young branches, sepals, ovary and the under side of leaves densely covered with short hairs. Leaflets six to eight pairs, oblong obtuse, pubescent on the upper side and dark-green, 1 to $1\frac{1}{4}$ by $\frac{1}{4}$ inch, prominently one-nerved, with a gland between the two of all or most pairs. Racemes of flowers in the upper axils; stamens as in *C. lævigata*. Pod 4 by $\frac{1}{4}$ inch tomentose. t. 92.

Nilgiris: in Ootacamund very common by road-sides. Pulneys: at Poombari, *Bourne* 903.

A native of tropical America in the valleys of the Andes from Bolivia to Central America.

Cassia mimosoides Linn.; *F.B.I.* ii 266, CIII 18; Pink or Yellow Ground-Cassia. A low diffuse perennial with slender downy branches. Stipules $\frac{1}{8}$ inch acute; leaves 1 to 2 inches. Leaf-stalk hairy, with one gland on below the lowest pair of leaflets, and produced beyond them in a soft spine; leaflets thirty to fifty pairs, $\frac{1}{8}$ by

1/30 inch linear, mucronate with a red outer margin. Flowers solitary, pedicelled in the leaf-axils; sepals 1/4 to 1/3 inch linear. Petals about as long. Stamens seven to ten filaments short; anthers some long, some short, and opening by terminal slits. Pod flat, 1 1/2 to 2 inches by 1/6 inch, the partitions inside oblique.

Pulneys: possibly at Kodaikanal. In woods and on shady road-sides. *Fyson* 3021. *Bourne* 100, 906,

Gen. Dist. Tropical Asia, Africa and Australia. Rare in America.

MIMOSÆ.

In this family (or sub-order) of the LEGUMINOSÆ the flowers are small and massed in small dense heads or short spikes; the petals all equal, often united at the base, and in bud valvate, none overlapping another; the stamens may be ten or very many. In other respects the family is as given for the LEGUMINOSÆ p. 93 but in many of the ACACIA genus the leaves are apparently simple.

Flower-heads globular: pod narrow ACACIA.
Flowers in thick spikes: pod very thin and broad . . . ALBIZZIA.

ACACIA. F.B.I. 50 CXXVII.

Wattle, etc.

Flowers small in yellowish balls 1/4 inch across; calyx campanulate 1/16 inch; petals united in the lower half; stamens many.

Species over 400. More than half Australian, the others in the tropics,

In many Australian species the leaves are apparently simple. Seedlings however all begin with bipinnate leaves, and the apparently simple leaf is really a broadened leaf-stalk of which the pinnae and leaflets have not developed: they are known as *phyllodes*. It will be seen that the veining of these is not like that of an ordinary leaf.

There are no species indigenous to these levels, but three or four introduced from Australia are now well established in and near hill stations.

- a { Leaves apparently simple. b
 Leaves bipinnate; leaflets forty to fifty pairs on each of
 eight to fifteen pairs of pinnae c
 b { Phyllode with one main nerve and many slender side-
 veins. A. *retinodes*.
 Phyllode with three or four main nerves and very
 slender parallel veins. A. *melanoxylon*.
 Foliage green, young shoots golden. Flower-heads pale,
 yellow. Pod distinctly constricted between the seeds.
 c { A. *decurrens*.
 Foliage bluish, young parts not yellow. Flower-heads
 golden yellow. Pod not constricted. A. *dealbata*.

Acacia retinodes Schlecht; Benth. Fl. Aust. ii 362, CXXVII *; a native of Victoria and South Australia. Bourne 2051.

Acacia melanoxylon R. Br.; Benth. Fl. Aust. ii 388; CXXVII **; Black-wood of Australia. Planted everywhere on these levels. Native of New South Wales, Victoria, Tasmania and South Australia. t. 93. Fyson 3024.

Acacia decurrens Willd.; Benth. Fl. Aust. ii 414; CXXVII ***; Green or Black Wattle of Australia. Planted. Native of South Australia, Tasmania, Victoria, New South Wales.

Acacia dealbata Link; Benth. Fl. Aust. ii 415; CXXVII ****; Silver Wattle of Australia. Native of New South Wales, Tasmania, Victoria. t. 94. Fyson 3022.

ALBIZZIA. F.B.I. 50 CXXVIII.

Like ACACIA but sepals and petals five each; stamens numerous, united at the base in a tube; pod very broad and thin; seeds compressed, their stalks slender.

Species 25 to 30, in the tropics of Africa, Asia and Australia. In India ten, one of the commonest being *A. lebbek*, common in Madras.

Albizzia lophantha Benth; CXXVIII 10 *; a small tree with bipinnate leaves of very small leaflets, and

remarkable for its thick axillary spikes of small flowers and thin flat pods.

Branches, leaf-stalks and peduncles usually velvety. Pinnae eight to ten pairs; leaflets twenty to thirty, or more pairs, $\frac{1}{4}$ inch long, narrow, with the vein near the upper margin; silky pubescent underneath. Flower-spikes, $1\frac{1}{2}$ to 3 inches long by $1\frac{1}{4}$ inches thick when the flowers open because of the long stamens; pedicels $\frac{1}{16}$ inch. Pod $3\frac{1}{2}$ inches by $\frac{3}{4}$ to $\frac{1}{2}$ inch, thin, the valves not twisting up after opening.

A native of western Australia but planted and now naturalised on the Nilgiris and one tree in Bombay shola near Kodaikanal (*Bourne*).

Seeds of this plant germinated after lying in England for 68 years in Sir John Herschell's cabinet (ms. at Kew).

ROSACEÆ.

Herbs, shrubs on trees with alternate, stipulate, simple or leathery leaves, and quite regular flowers of five free sepals, with occasionally an *epicalyx* of five bracteoles below them; five free rounded petals attached to the margin of a cup-shaped or ring-shaped honey-secreting disc; numerous stamens bent inwards in bud, and with small anthers; and one or more carpels, with one or more seeds in each.

The centre of the flower may be raised and the carpels separate, ripening into (dry) achenes as in the Strawberry where the *torus* (centre) becomes juicy, or into juicy berries enclosing each one small stone as in the Raspberry; or it may be nearly or quite flat with one carpel only which ripens into a stone fruit, as in the Plum, Cherry and Apricot; or be hollowed and enclose a few one-seeded carpels, as in the Lady's-mantle and Agrimony; or have many carpels which lie free inside what is eventually a more or less juicy case (*calyx-tube*), as in

the Rose; or the carpels may be completely sunk in a juicy fruit, with the seeds inside hard stones as in the Hawthorn, or in horny cases as in the Apple and Pear. All these variations in the fruit are met with in our flora.

Species over 1,000, all over the world but mostly in temperate climates and the countries surrounding the Pacific Ocean.

KEY TO THE GENERA.

- | | | | |
|---|---|--|--------------|
| a | { | Leaves simple, entire or toothed not lobed b | |
| | | Leaves rounded, with five or seven rounded finely toothed lobes. Flowers small and greenish <i>p.</i> 137. | ALCHEMILLA. |
| b | { | Leaves lobed or of several leaflets e | |
| | | Leaves 3 to 5 inches quite entire: fruit leathery, mallet-shaped <i>p.</i> 130. PYGEUM. | |
| c | { | Leaves entire or toothed: fruit juicy enclosing a stone. c | |
| | | Leaves $\frac{1}{2}$ inch, silvery below: small shrub. . . . <i>p.</i> 140. | COTONEASTER. |
| d | { | Leaves 3 to 6 inches: trees <i>p.</i> 139. PHOTINIA. | |
| | | Flowers 2 to 3 inches across: carpels enclosed in the calyx-tube <i>p.</i> 138. ROSA. | |
| e | { | Flowers 1 inch or less, carpels on the outside of the torus f | |
| | | Carpels in fruit juicy: leaves pinnate or lobed: prickly shrubs <i>p.</i> 131. RUBUS. | |
| f | { | Carpels in fruit dry (achenes): herbs g | |
| | | Leaflets three only, torus in fruit juicy <i>p.</i> 135. FRAGARIA. | |
| | | Leaflets five or seven, torus in fruit dry <i>p.</i> 136. POTENTILLA. | |

PYGEUM.

F.B.I. 51 V.

Evergreen shrubs and trees with small greenish, often imperfect flowers in axillary racemes. Stamens many. Cappel one only, ripening to a transversely oblong or mallet-shaped leathery fruit, attached by its middle.

Species 18. South Asia, Ceylon, Malaya.

Pygeum gardneri Hook. f.; F.B.I. ii 321, V 12; a large tree with smooth pointed leaves and axillary spikes of small velvety flowers of many sepals but no petals, and

mallet-head fruits. Branches lenticelled, glabrous; stipules minute, soon falling. Leaves 4 to 8 by $1\frac{1}{2}$ to 3 inches ovate, acuminate, entire, base rounded or acute, veins conspicuous below: stalks $\frac{1}{2}$ to 1 inch, stout. Spikes 2 to 4 inches, with stout, thickly pubescent rachis: pedicels $\frac{1}{8}$ inch stout. Flowers $\frac{1}{4}$ inch across. Calyx obconic with ten to twelve hairy obtuse lobes alternately larger and smaller, deciduous as a whole. Petals none. Stamens twice as many in two rows, exserted. Ovary glabrous surrounded at the base by hairs: style short. Fruit $\frac{3}{4}$ to $1\frac{1}{4}$ by $\frac{1}{2}$ inch, transversely oblong and obscurely two-lobed, rounded at the ends attached by the middle of one side. Wight Ic. t. 993.

Pulneys: Kodaikanal. In the station shola and in others. Nilgiris: hill above Pykara 7,500 feet. Flowering after the rains, fruiting in December and June. *Bourne* 474, 915, 2593.

Gen. Dist. Western Ghats and northwards to Mableswhar.

In F.B.I. the stamens are given as twelve and short. *C.F.B.* rightly gives them as more than twenty and well exserted. Both remark on the inequality of the lobes of the calyx, they seem to me alternately large and small.

Some species have glands at the base of the leaves, this one has not.

RUBUS.

F.B.I. 51 VIII.

Bramble.

Herbs or prickly shrubs with simple lobed or compound leaves, and terminal or axillary corymbs of pink or white flowers of five sepals, five petals, many stamens and on a raised centre (torus) many separate carpels, each of which becomes fleshy, with a small stone inside; the whole fruit being composed therefore of a number of small drupes (Blackberry, Raspberry).

Species about 100, abundant in the northern hemisphere.

Great variations occur in both the leaves and inflorescence of many of these species, and this has led to the genus being divided up not only into sections or subgenera and species but the latter also again into sub-species and micro-species, which are supposed to come true to seed. The genus has recently been monographed on these lines by Foëbe. I have not

however been able to determine with any degree of confidence my Nilgiri and Pulney specimens from his descriptions and retain therefore the more comprehensive species of the F.B.I. which are the group species or subgenera of Foche.

Leaves simple, lobed *R. moluccanus*.
 Leaves of three leaflets *R. ellipticus*.
 Leaves of five to seven leaflets *R. lasiocarpus*, etc.

***Rubus moluccanus* Linn.; F.B.I. ii 330, VIII 11; Purple Bramble.** Very prickly shrubs, the shoots covered with a dense or fine tomentum. Leaves up to 8 inches by 5 inches, simple, with three to seven lobes, ovate or triangular, deeply cordate at the base, very rugose on the upper side by the impression of the veins, tomentose on the under. Stipules oblong, laciniate or fimbriate. Flowers in terminal panicles. Bracts deeply cut. Sepals tomentose with fimbriate margin. Petals white. Fruit dark purple. t. 96. Wight Ic. 225.

Everywhere on the downs of Ootacamund and Kodaikanal forming thick clumps, but not seen below our level.

Gen. Dist. Central, eastern and tropical Himalayas, Nepal, Sikkim, Burma, Assam, South Indian hills but not, or only very rarely, on the Bombay Ghats, Ceylon, Malaya.

Foche has divided this species into very many micro-species. Of these we may have:

i. *R. (moluccanus Ser: alcæfolia) fulvus* Foche; leaves acuminate, not lobed towards the apex. (*Fyson* 519). ii. *R. (moluccanus Ser: rugosi) fairholmianus* Gardner leaves sinuate-lobed white-tomentose underneath, branches very prickly. (*Fyson* 2982.) But I cannot give these with any certainty.

***Rubus ellipticus* Smith; F.B.I. ii 336, VIII 28.** Yellow Bramble or Yellow Raspberry. Shrub, young parts covered with white tomentum partially or wholly concealed by red hairs; prickles slender, curved down. Leaves pinnately three-foliate; leaflets 1 to 4 inches, rounded or pointed, obovate or elliptic or nearly circular, irregularly dentate, very variable in regard to the covering of the lower surface, that being nearly glabrous, white-tomentose, or shaggy; midrib with prickles: nerves very straight forking near the margin: terminal leaflet 1 to 4

inches; lateral smaller, sometimes only half as long. Flowers in dense terminal and axillary racemose panicles: bracts lanceolate. Sepals ovate, acute or mucronate, white on the outer (under) side, with or without red hairs. Fruit yellow, luscious with the flavour of a Raspberry. Wight Ic. 230.

On the open downs. Pulneys near Kodaikanal. Nilgiris: Ootacamund to Neduwattum 5,500 feet. *Fyson* 267, 642. *Bourne* 1626.

Gen. Dist. Temperate and tropical Himalaya, Khasia, Burma, Western Ghats but not in Bombay *C.B.F.* Ceylon, Yunnan.

var wallichiana *Wight and Arnott ex Focke*; leaves green underneath; appears to me to be connected with the type by many gradations.

Rubus lasiocarpus *Smith* and *R. racemosus* *Roxburgh*.

For convenience of distinguishing these two very closely allied species, I take them together.

Rambling shrubs with odd-pinnate leaves of seven, five or occasionally three leaflets. Older branches reddish brown, often with a white powdery bloom, very prickly, as also the leaf-stalks and even the midrib of the end leaflets. Lateral leaflets ovate or obovate, acute or not; end one broader and more rounded at the base, often lobed; all sharply and irregularly toothed, and with five to ten pairs of very straight veins running from the midrib right to the margin, near which they may fork: but occasionally, especially when there are only three leaflets, the terminal one has three veins from the base, exactly as if the three end leaflets were fused in one. Flowers in corymbs terminal and axillary: pedicels slender, $\frac{1}{4}$ to $\frac{3}{4}$ inch. Sepals triangular acute or long pointed. Petals red, roundish. Carpels hairy, fruits red always in flower.

i. *R. lasiocarpus* *Smith* (? *var pauciflorus*); *F.B.I.* ii 339, VIII 35. Branchlets and other parts without glands, but covered with a dense white tomentum, as also the

undersides of the leaflets and the inflorescence. Leaves 4 to 7 inches, lateral leaflets 1 to $2\frac{1}{2}$ inches. Flowers many, $\frac{1}{2}$ inch across. Sepals densely white inside and out, acute but not acuminate. Fruit $\frac{1}{2}$ inch, red.

Pulneys : Kodaikanal downs in thickets, common. Nilgiris : Coonoor. *Fyson* 441. *Bourne* 1064.

Gen. Dist. Widely over the mountains of India, Ceylon, Burma, Java.

ii. *R. racemosus Roxburgh (hairy form)* ; *F.B.I.* ii 340, VIII 36. Branchlets, leaf-stalks, and inflorescence clothed with glandular hairs and also other short hairs, but not a thick tomentum. Leaves from 4 inches, including the stalk to 8 inches. Leaflets five or three, densely white below ; the lateral $1\frac{1}{2}$ to $3\frac{1}{2}$ inches, acute or obtuse. Flowers few, nearly an inch across on pedicels of $\frac{1}{2}$ to $\frac{3}{4}$ inch in mostly axillary corymbs or corymbose cymes. Sepals white inside and out, prickly, with fine point (acuminate). Petals as long or longer, $\frac{1}{4}$ inch across, distinctly stalked. Fruiting stalks decurved. t. 97.

Kodaikanal downs. Vembadi shola. *Bourne*. Nilgiris : on the downs. *Fyson* 1043, 3025, 2941.

This occurs also near Ootacamund with much white bloom on the branches and corymbs mainly *terminal*. Also, with long dark purple branches covered with white bloom, leafless but bearing short leafy twigs covered with red hairs ; corymbs in the uppermost axils very dense ; fruiting pedicels decurved and the adjacent corymbs forming together dense terminal clusters of fruit. Pykara. *Fyson* 2663.

iii. *R. racemosus Roxburgh (glabrous form)*. Branchlets and other parts with glandular hairs and also few simple ones ; but not white. Leaflets seven or five green and glabrous below. Flowers as in No. ii, but sepals not white behind except on the edges. Prickles on the older branches perhaps stouter.

Kodaikanal in a shola on the Poombari road. (*Bourne* 917.) Flowers in December and June and presumably all the year.

This plant is exactly matched by a sheet of Wight's (*Kew Dist.* 912, at Kew), labelled *Pulney mountains September 1836* and is probably therefore the plant referred to in the F.B.I. as Wight's glabrous specimen, which resembled *var subglaber* of *R. lasiocarpus*.

FRAGARIA.

F.B.I. 51 X.

Strawberry.

Small herbs with trifoliate leaves and creeping stolons, by which they spread and multiply; and distinguished in fruit by the fleshy torus on which the dry seed-like achenes are set. Branches, leaves, etc., silky; stipules large. Flowers on axillary stalks mostly solitary. Calyx tube wide, bearing below an epicalyx of five green bracteoles alternating with the sepals; both persistent. Stamens about twenty. Carpels on a convex centre which in fruit becomes fleshy; achenes very numerous and small, glabrous.

A very small genus of perhaps half a dozen species, found only in temperate and alpine climates, all over the northern hemisphere, but also on the mountains of Mexico and Chile.

Named from the Latin FRAGRANS because of the fragrant fruit.

Flowers white in tall panicles; fruits pale pink. *F. nilgerrensis*.
Flowers yellow, solitary; fruits red *F. indica*.

Fragaria indica Andr.; *F.B.I.* ii 343, X 1; Red Strawberry. Rootstock stout, runners slender, with long internodes making the plant diffuse; green parts more or less silky, densely hairy below. Flowers $\frac{1}{2}$ to 1 inch across, on peduncles of 2 to 4 inches; epicalyx broadly triangular and three-lobed, sometimes much exceeding the sepals and reflexed in fruit, but also smaller and less conspicuous. Petals yellow. Fruit bright red, $\frac{1}{4}$ to $\frac{1}{2}$ inch diameter spherical, achenes obscurely pitted. t. 98. Wight Ic. t. 989.

Pulneys: Kodaikanal, but apparently very rare. *Fyson* 297.
Nilgiris: *Bourne, Wight*.

My Kodaikanal specimen has leaflets distinctly stalked, one and one-fourth by three-fourth inch broad, and one of the internodes of the runner

over 5 inches. The stipules are narrow and one-fourth inch, and the bracteoles of the epicalyx half inch long and wide. B's Pykara specimen has leaflets less than half inch, bracteoles less than one-third inch, and stipules less than one-sixth inch.

Gen. Dist. Temperate and sub-tropical Himalaya, Sikkim 4 to 8,000 feet, Darjeeling, Khasia, Tenasserim.

***Fragaria nilgerrensis* Schldl.; F.B.I. ii 344, X 3;** White Nilgiri Strawberry. A strong growing plant, with stout rootstock surrounded by the broad bases of the leaf-stalks, with their stipules of $\frac{1}{2}$ to $\frac{3}{4}$ inch. All green parts clothed with stout hairs. Leaflets regularly and coarsely toothed; veins numerous, close, running parallel and straight from the midrib nearly to the margin. Panicle repeatedly forked, 6 to 8 inches high; bracts $\frac{1}{3}$ to $\frac{1}{2}$ inch. Flowers $\frac{3}{8}$ to $\frac{5}{8}$ inch across. Sepals reflexed in fruit. Fruit conical, pale, sweetish. t. 99. Wight Sp. Nilg. t. 61 (F. elatior), Ic. t. 988.

In shady places flowering early summer. Pulneys: Kodaikanal, etc. Nilgiris: Ootacamund, Pykara. *Bourne* 1065.

F.B.I. unites with this plant one from the Khasi hills, which however differs slightly in fruit.

POTENTILLA.

F.B.I. 51 XI.

Small herbs in habit like the Strawberry, but with hard, not juicy fruits (*torus*) and usually with at least the lower leaves of five or more leaflets.

Species about 150 in the cold and temperate regions of the northern hemisphere; on tropical mountains and in the southern hemisphere only a very few. Great Britain has 9 species—Cinquefoil, Silverweed, etc.

***Potentilla leschenaultiana* Ser.; F.B.I. ii 350, XI 15.** Whole plant softly hairy, much tufted, a few inches high. Root very stout tapering downwards, the top (rootstock) $\frac{3}{4}$ inch, covered with the remains of the leaf-bases. Lower leaves with their stalks, 6 to 10 inches; leaflets three at the end of the stalk, and a pair a little below, and sometimes a second pair a third down the

stalk. Upper leaves three-foliate : leaflets $\frac{3}{4}$ to 3 by $\frac{1}{2}$ to $1\frac{1}{8}$ inches, obovate-oblong with cuneate base, closely and deeply serrate, with broadly triangular sharp or blunt teeth. Stipules large. Corymb branches much forked. t. 100. Wight Ic. 990.

In open grass land common. *Fyson* 578, 727, 2077, 2112. *Bourne* 918, 1066.

Very variable in size and hairiness. Glabrous specimens from Kodai-kanal are very similar to *P. fragarioides* L. but the teeth are not so sharp.

This name was given (DC. Prod. ii. 584) to the Nilgiri plant. The species should perhaps be reduced to *P. fragarioides* L. which occurs all over northern Asia and Europe.

ALCHEMILLA.

F.B.I. 51 XIII.

Lady's-mantle.

Small herbs with trailing stems and long stalked roundish leaves, peculiar in their very regular rounded lobing and the strong palmate nervation and fanwise folding ; and characterised by the small greenish flowers of four sepals, no petals, and one to four inferior carpels enclosed in the calyx-tube.

Species about 60. Mostly from the Andes of Central America from Mexico to north Chili. A few in the temperate zone of the northern hemisphere, mountains of India, Ceylon, Madagascar, South Africa and Java. Absent from northern India, south of Kashmir, Australia and temperate North America.

Some of the species on the Peruvian Andes show marked adaptation to the conditions of mountain life : they grow in tufts with small leaves closely appressed to the stem, as woolly points resembling the Horsetails.

Alchemilla indica Gard. ; F.B.I. ii 361, XIII 2 ; Indian Lady's-mantle. Rootstock woody ; stem slender, $1/10$ inch thick, trailing in grass, covered with soft hairs. Leaf-stalk 1 to 2 inches ; stipules $\frac{1}{2}$ inch connected into a tube with oblong acute tips. Blades circular and deeply cordate (or kidney-shaped) very evenly five to seven-lobed ; the lobes rounded finely toothed ; glabrous above,

nearly so underneath; margin silky; nerves one to each lobe; veins obscure; stalk of inflorescence up to $5\frac{1}{2}$ inches, forked or branched several times with small deeply lobed or three-fid bracts. Flowers $\frac{1}{8}$ to $\frac{1}{6}$ inch across. Sepals eight, villous outside, glabrous inside, outer four sepals smaller; inner four triangular, thin. Stamens four, alternating with these. Wight Ic. t. 229.

In open grass land, on the downs not abundant. *Fyson* 2223, 2913. *Bourne* 717.

Very similar to the Lady's-mantle of Great Britain.

ROSA.

F.B.I. 51 XVI.

Rose.

Very prickly often straggling shrubs with odd-pinnate leaves having large stipules adnate to the leaf-stalk, and showy terminal flowers solitary or in corymbs; distinguished from all others of the family by the egg-shaped calyx tube in which are a number of separate carpels each with its style protruding through the mouth of the chamber, and which in fruit becomes slightly enlarged and edible, and contains a number of hairy achenes.

Many of the species are highly variable and the number is variously put at from 30 to 300 according to the conception of species held. *Dist.* over the temperate and sub-alpine regions of the northern hemisphere but rare in America; not south of Abyssinia, India or Mexico.

Rosa leschenaultiana *Wight and Arnott*; *F.B.I.* ii 368 XVI 9; Nilgiri Dog-rose. A large straggler. Leaflets five, glabrous, obovate-oblong-acute or shortly acuminate, sharply and finely serrate, glabrous on both sides: midrib with a few prickles: main stalk glandular and prickly; stipules adnate for as much as an inch with five-spreading points. Flowers several in terminal cymose corymbs: pedicels slender. Calyx tube contracted below the much larger acuminate sepals. Flowers 2 to 3 inches diameter t. 101. t.t. 101, 102, 103. Wight Ic. t. 38.

On the edges of shola, road-sides, etc. Abundant. Nilgiris : Ootacamund, Pykara, flowering May.

Gen. Dist. Nilgiri and Pulney hills only.

PHOTINIA.

F.B.I. 51 XXI.

Trees with simple evergreen leaves and small flowers of five sepals, five petals, many stamens, and a few (one to five) carpels, entirely enclosed in calyx tube which ripens into a small berry with one to five thin-walled chambers containing the seeds.

Species under ten in tropical and sub-tropical regions of Asia.
 Leaves serrate or crenate P. lindleyana.
 Leaves quite entire P. notoniana.

Photinia lindleyana Wight and Arnott ; *Herb. Wight Prop.* 1012 and 1013 ! ; *F.B.I.* ii 380, XXI 1 ; Lindley's Rowan. A medium-sized tree with crooked branches. Leaf-stalks $1\frac{1}{2}$ inches, red : blade ovate-elliptic, rounded or occasionally unequal at the base, acute-mucronate, serrate-crenate or sometimes almost entire, very hard and coriaceous, dark-green above, lighter underneath ; nerves slender about sixteen pairs, joined by close reticulation. Panicle irregular, $1\frac{1}{2}$ to 3 inches high, few flowered. Fruit $\frac{1}{4}$ inch. t. 102. Wight Ic. t. 228.

Nilgiris : Pykara, Coonoor. Not collected on Pulneys *Fyson* 2229, 2471, 2533.

In outline the tree is somewhat like *P. notoniana* but flatter, without tall pyramidal masses of foliage.

Photinia notoniana Wight and Arnott ; *Herb. Wight Prop.* 1014 ! ; *F.B.I.* ii 380, XXI 2 ; common Pulney Rowan. In the open a small, or in woods a large, tree with straight or crooked trunk and spreading branches. Bark rough and dark, and on the young branches smooth but for the numerous lenticels : branchlets angular green or red. Leaf-stalks $\frac{3}{4}$ to $1\frac{1}{2}$ inches, glabrous as

is the whole plant except the inflorescence. Blades quite entire, ovate, oblong-obovate or oblanceolate, abruptly acuminate: midrib stout, nerves slender about $\frac{1}{4}$ inch apart, joined by a close net-work of veins. Panicles terminal, rounded, excessively branched; the branches greenish white pubescent, becoming stout in fruit. Flowers sessile, sepals minute, rounded, white or tinged with pink. Petals $\frac{1}{16}$ inch, rounded, white. Stamens about four times as many, in four whorls: filaments white; those of the two outer whorls spreading as long as the petals, those of the inner shorter and erect. Ovary two-celled, the crown hemispheric, reddish, pubescent. Fruit a round purple berry $\frac{1}{5}$ inch diameter, quite smooth with a small five-lobed depression; flesh very acid. Seeds brown $\frac{1}{8}$ by $\frac{1}{16}$ inch, elliptic, with short blunt point at the upper end, bent to one side. Wight Ic. t. 991, Ill. t. 86.

The habit of the young shoots which grow often to 4 or 5 feet above the rest remind one of the Apple and Pear, near relatives of this genus. In September the trees often show tall irregular masses of erect bright purplish red leaves, as if on stumps denuded of their smaller branches. The fruit reminds one of the Rowan or Mountain Ash.

On the outskirts of sholas on the Nilgiri and Pulney downs 6,500 feet and above. Flowers September in profusion of white blossom.

Hyson 1119, 1124, 2004, 2609, 3024. *Bourne* 328, 1383, 2598.

COTONEASTER.

F.B.I. 51 XXV.

Shrubs or small trees with entire leathery leaves, often downy on the backs; and axillary or terminal cymes of small flowers, with five sepals on a top-shaped calyx tube, five petals, about twenty stamens, an ovary of two to five cells, and a small fruit with two to five hard one-seeded stones.

Species 20 to 30, difficult to distinguish, scattered over Asia, Europe and North America. One or two are commonly cultivated in English gardens for the brightly coloured fruits which remain on through the early winter.

Cotoneaster buxifolia Wall. ; *F.B.I.* iii 387, XXV 11.
A small shrub often only $1\frac{1}{2}$ feet high with thick woody branches. Leaves $\frac{1}{4}$ to $\frac{1}{2}$ inch, elliptic entire, acute at both ends, one-nerved. Flowers $\frac{1}{4}$ inch in small clusters. Fruit globular, scarlet.

Nilgiris : in Ootacamund? wild ; abundant in the Kaity valley and near the old Boer camp. Pulneys : Poombari but not seen at high levels.

Gen. Dist. Doubtfully on the Himalayas.

SAXIFRAGACEÆ.

A large family not easy of definition but typically with perfectly regular flowers of five sepals, five petals, five or ten stamens, and semi-inferior ovary of two or three cells.

Well-known wild or garden plants are Saxifrage, *Ger.* Steinbrech, London-Pride, Grass of Parnassus, Hydrangea, Deutzia, Philadelphus ("Syringa") and Currant. Species 5 or 600 all over the world.

PARNASSIA.

F.B.I. VI.

Grass of Parnassus.

Marsh plants with perennial rootstock. Leaves all radical, heart-shaped, entire, glabrous, long-stalked. Flowers solitary on slender much longer stalks with a bract about half way up ; white or very pale yellow. Sepals, petals, stamens and staminodes five, in alternating whorls. Ovary one-celled, with three or four nearly sessile stigmas, and, inside, alternating with the stigmas, as many parietal placentas to which are attached the numerous horizontal ovules. Seeds with thick embryo and thin endosperm. Capsule semi-superior, small, globose, one-celled, opening by three or four valves.

Species about 12, over the northern hemisphere extending south to these hills.

The species differ very little in general appearance, though slightly in regard to size, which is always an uncertain character. The main differences lie in the shape of the staminodes, whether fimbriate, three-lobed, or club-shaped, and of the petals, whether entire or cut. The staminodes end in glistening drops of honey, or in some merely appear to do so, and thus attract flies by whom cross-pollination is carried out.

Petals fimbriate, white or pale yellow, $\frac{1}{2}$ inch; lobes of staminodes three, cylindrical *P. wightiana*.

Petals entire or nearly so, white, $\frac{1}{4}$ inch; lobes of staminodes three, obscure and rounded *P. mysorensis*.

Parnassia wightiana Wall.; *F.B.I.* ii 402, VI 3; Grass of Parnassus of Ootacamund. Leaf-stalks 2 to 4 inches, blades $\frac{3}{4}$ to 1 inch broad, deeply cordate, with five basal veins, the three inner curving forward to meet at the apex. Flowering stems 6 to 8 inches, or more, with a bract half way up nearly as large as the leaves, and similar to them, clasping the stem. Sepals $\frac{1}{4}$ inch. Petals $\frac{1}{3}$ to $\frac{1}{2}$ inch, oblong obovate, fringed in the lower and narrower part with slender hair-like fimbriæ, white or pale yellow. Staminodes as long as the stamens ending above in three oblong processes with globular glandular heads. Capsule rounded, obcordate; seeds all near its base, ellipsoid with wrinkled coat. *A.*, *B.* staminodes of another plant (? same species).

On the Ootacamund downs in swamps, common. Flowers after the beginning of the rains. Not at Kodaikanal. *Fyson* 3070. *Bourne* 4608, 5211.

Gen. Dist. On the southern and eastern Himalayas, Khasia, etc., China and Yunnan. Not northwards on these ghats, nor on the Himalayas at Simla.

Though placed in a different section of the genus because the staminodes are less divided at the top, in general appearance this is remarkably like the European species, *P. palustris*, *Fr.* Parnassie des marais, *Ger.* Herzblumchen.

Parnassia mysorensis Heyne; *Herb. Rottler.*, *Wall. Cat.* 3754!; not of *F.B.I.*; VI 6*; Grass of Parnassus of Kodaikanal. Leaf-stalks, $\frac{1}{2}$ to 2 inches: blades cordate, nearly circular, thick, with five or seven veins curving forwards to the apex but not conspicuous. Flower stems 5 to 8

inches: bract about half way, like the leaves or more often smaller. Sepals $\frac{1}{6}$ inch. Petals obovate-oblong, the narrow basal part entire or nearly so. Staminodes obscurely three-lobed or club-shaped, much shorter than the stamens. Capsule obcordate, three-lobed; seeds small. t. 103-A. S = petal and staminode [*E.T.B.*]; B = staminode [*P.F.F.*]. Wight Ill. t. 21.

Pulneys: in swamps and damp places near sholas, common. Nilgiris: ? Avalanche *Wight*.

Gen. Dist. Pulneys, Mysore, Bababoodons. *Fyson* 1839, 2165. *Bourne* 581, 1000, 2600.

This is undoubtedly the plant figured by Wight in his Ill. t. 21 under this name, but the staminodes are not as described in W. & A. Prod. i. p. 35. Wight's specimen from Avalanche has indeed staminodes rather more deeply lobed than his figure.

CRASSULACEÆ.

A cosmopolitan family, closely allied to the last, and differing from it chiefly in the carpels being of the same number as the petals or sepals, so that the flowers are perfectly symmetrical. The fruit too consists of follicles (the carpels being separate), which open down the inner faces and have usually many seeds. In some genera the petals are united into a tube, so that the distinction of polypetally and sympetally, so important in other cases, here breaks down. A very large number of the family have smooth succulent leaves, and are able to grow in places where water is at times scarce; thus the Stone-crop or Wall-pepper, *Ger. Mauerpfeffer*, *Fr. Orpin*; Pennywort and House leek, *Ger. Hauslauch*, *Fr. Joubarbe*; and the common BRYOPHYLLUM of the Indian plains, whose leaves will remain alive for weeks after being detached from the plant, and throw out shoots and roots.

Species 400, scattered all over the world, except Polynesia, rare in Australia and South and North America.

KALANCHOE.

F.B.I. 53 IV.

Stout perennial herbs with lower leaves at least opposite; four-partite calyx; flask-shaped tubular corolla with four spreading lobes, persistent round the fruit; eight stamens; and oblong seeds with eight to fifteen longitudinal ribs.

Species 25 chiefly in tropical and South Africa, some in Asia, one in Brazil.

Kalanchoe grandiflora Wight and Arnott; *F.B.I.* ii 415, IV 4; the Giant Cabbage flower. A thick-stemmed, thick-leaved shrub with masses of bright yellow four-petalled flowers.

Stem and lower branches an inch or more thick, but tapering upwards, round and smooth except for the numerous flat leaf-scars, which are in opposite pairs and may be $\frac{3}{4}$ inch wide and $\frac{1}{4}$ inch deep and are joined round the axis by a smooth ridge, the younger scars showing a row of three to six bundle-scars. Leaves opposite, obovate-obtuse, almost flat at the end, crenulate, glabrous, glaucous and thick. Flowering stem terminal, leafless, two or three feet high, dividing above repeatedly into three yellowish-green branches, the middle one of which always ends in a flower (very regular three-chotomous cymose panicle). Bracts $\frac{1}{20}$ to $\frac{1}{4}$ inch scarious, obovate or elliptic acute: pedicels $\frac{1}{2}$ to $\frac{3}{4}$ inch expanded under the flower. Calyx tube $\frac{1}{10}$ inch sepals $\frac{1}{4}$ by $\frac{1}{6}$ inch, oblong-acute. Corolla tube, four-angled, $\frac{1}{2}$ inch, contracted at the top and then spreading in four yellow obovate lobes $\frac{1}{2}$ by $\frac{1}{4}$ inch. Stamens eight, four at the mouth of the tube between the lobes and very short, four longer, about $\frac{1}{16}$ inch, on the base of the lobes: anthers small. Carpels distinct very nearly to the base, $\frac{1}{6}$ by $\frac{3}{8}$ inch tapering above to the $\frac{1}{6}$ inch style: a slender gland or staminode $\frac{1}{6}$ inch long opposite each,

Seeds very numerous, attached in pairs on rounded bases to the placentas. Fruit sheathed by the dried, stretched, corolla tube. t. 104. Wight Ill. t. III.

On the higher slopes on rocky ground or poor soil. Near Ootacamund it flowers December to February in masses on the Dodabetta-Snowdon ridge, colouring it yellow. Occasional flowers may be found up to July. Pulneys: on downs towards Fort Hamilton, flowering December. *Fyson* 307, 676, 2166. *Bourne* 922, 2601, 4667.

KALANCHOE is the Chinese name of one species.

DROSERACEÆ.

A small family of 110 species chiefly remarkable for their folding or sticky leaves by which small insects are caught and digested.

DROSERA.

F.B.I. 54 I.

Sundew.

Small herbs with perennial rootstock or tuber. All the leaves as a rosette on the ground or some on a short stem, covered with long stalked sticky glands. Flowers in raceme-like scorpioid cymes. Calyx-tube short; sepals four or five suberect, imbricate. Petals as many persistent. Stamens as many. Ovary free of the calyx, one-celled with two to five styles.

Species about 90 distributed all over the world except the Pacific islands.

The glands are of two kinds, long stalked glands which secrete a sticky solution by which flies and other small winged insects are caught, and which then by a bending of the stalk bring the insect close against the leaf, and short ones almost sessile on the surface of the leaf. See Darwin's *Insectivorous plants*.

No stem. Leaves all on the ground forming a red rosette.

D. *burmanni*.

Stem leafy, 3 inches, with peltate leaves. . . . D. *peltata*.

Drosera burmanni Vahl.; F.B.I. ii 424, I 1; common Sundew. Flowering stems 3 to 6 inches, bare for the

lower four-fifths. Leaves in a rosette 1 inch across, very red and glistening, fringed with long-stalked glands, cuneate or spatulate; with linear stipules half as long as the stalks. Flowering stem 3 to 6 inches: flowers in a close one-sided raceme-like scorpioid cyme, white. Sepals entire covered with minute papillæ. t. 105. Wight Ill. t. 20 ex. styles; Ic. t. 944.

In damp places common. Everywhere from near Madras to the top of these hills.

Gen. Dist. All over India. *Bourne* 303.

Drosera peltata Smith; *var* *lunata*; *F.B.I.* ii 424, I 3; Moon-leaf Sundew; a delicate herb distinguished among all our plants by the roundish crescent-shaped leaves, $\frac{1}{6}$ inch across, fringed by long-stalked glands, and attached by stalks of $\frac{1}{2}$ inch to the slender almost unbranched stems. Perennial by means of a series of root-tubers.* Stem 3 to 12 inches, very slender often red. Rosette (? annual) leaves of the young plant soon disappearing so that only stem leaves remain. Stalk of stem leaves $\frac{1}{2}$ inch, blade $\frac{1}{6}$ to $\frac{1}{4}$ inch, with fringe of long-stalked glands, often red, very sticky. Sepals not fimbriate. t. 106. Wight Ill. t. 20.

On the open downs everywhere, more especially in damp spots. *Bourne* 924.

Distributed throughout India.

HALORAGIACEÆ.

Weak water or land plants with opposite or whorled exstipulate leaves, and small flowers with the parts in fours or by reduction fewer, and an inferior ovary containing typically four seeds.

Species about 80, all over the world. In Europe Marestalk, *Ger.* Tannenweudel; Water milfoil, *Ger.* Tausendblatt, *Fr.* Mille feuille d'eau; and Hornwort *Fr.* Cornifle.

* Clarence in manuscript note in Herb. Kew,

SERPICULA.

F.B.I. 56 II.

Flowers unisexual and monœcious, male flowers on long slender stalks of four acute sepals, four petals, eight stamens with very short filaments and long basifixed extrorse anthers, and four rudimentary stigmas but no ovary. Female flowers with no petals nor stamens, but a one-celled ovary with four stigmas and four seeds : fruit minute one-seeded, eight-ribbed or smooth.

Species under five in the marshes of Asia, Africa and America.

Serpicula indica Thwaites ; F.B.I. ii 432, II 2 ; small marsh herbs, with opposite leaves and small unisexual inconspicuous flowers. Stem single or branched, very variable in length and robustness, from 2 to 14 inches, glabrous or nearly so. Leaves from $\frac{1}{4}$ by $\frac{1}{16}$ inch, to $\frac{5}{8}$ by $\frac{1}{4}$ inch, oblanceolate, entire cuneate at the base, with four wide spreading acute teeth and a middle ovate one. Ovary flowers shortly stalked, $\frac{1}{30}$ by $\frac{1}{40}$ inch elliptic, the calyx-tube surmounted by four small lobes. Male flowers on hair-like pedicels of $\frac{1}{2}$ to $\frac{3}{4}$ inch in the same axils as the female. Sepals $\frac{1}{50}$ inch. Petals $\frac{1}{10}$ inch, boat-shaped, soon falling. Anthers as long. Nut rugose, $\frac{1}{30}$ inch, with about eight ridges in the lower half. Wight Ic. t. 1001.

On the Ootacamund and Kodaikanal downs in water. Quite common. Not on the ghats to the north, nor on the Himalayas.

Gen. Dist. Southern India. *Bourne* 698, 925.

In the F.B.I. the leaves are given as ciliate, and the fruit as not ridged. The more robust specimens would appear to approach *S. veronicaefolia* Bory, of Java, very closely.

MYRTACEÆ.

The chief characteristics of this family are the opposite gland-dotted leaves, inferior ovary, roundish quickly falling petals, and long stamens curled inwards in bud. Most are trees or shrubs, herbs being rare, and

even when the translucent glands are not conspicuous the leaves have as a rule a distinct scent.

Species about 2,000 in the warmer parts of the world.

Leaves linear, $\frac{1}{8}$ inch wide. Flowers small . . .	BÆCKEA.
Leaves broad with three main nerves. . .	RHODOMYRTUS.
Leaves broad with midrib and slender veins . . .	EUGENIA.
Leaves broad, of mature plants alternate . . .	EUCALYPTUS.
Flowers in globular heads	SYNCARPIA.

BÆCKEA.

F.B.I. 59 I.

Leaves narrow and small. Flowers small. Stamens five or ten only. Ovary two to three-celled; ovules many on peltate placentas.

Species 60, mostly Australian.

Bæckea virgata Andrs.; 12. Loosely branched shrub with slender twigs. Leaves $\frac{5}{8}$ by $\frac{1}{8}$ inch, linear-lanceolate to narrow-oblong, acute, flat, one-nerved, with numerous pellucid glands raised on the lower side when dry. Flowers in the upper axils, umbelled by pedicels of $\frac{1}{5}$ inch on peduncles of $\frac{1}{2}$ inch. Calyx hemispheric, $\frac{1}{8}$ inch lobes small and round. Petals round, stamens five: filaments short. Ovary inferior, three-celled: ovules round the edges of peltate placentas. Capsule flat-topped.

An introduction from Australia, native from Victoria northwards to Queensland. *Fyson* 1864, 2167.

EUCALYPTUS.

59 II.*

Australian Gum.

Trees with the leaves on the young plants, and on those which spring up from a stump, opposite, sessile horizontal; but on the upper and newer branches alternate, petioled and drooping. Flowers three or more, on axillary peduncles. Calyx top-shaped, scarcely toothed. Petals five, united into a hemispherical cap which soon falls

being pushed off by the very numerous, long, slender, many-seriate stamens, with small versatile anthers. Ovary immersed in the calyx-tube, three or four-celled, with slender style and small stigma : ovules many. Fruit, a hard conical capsule, opening by valves at the top. Seeds small, linear-cuneate : embryo straight, cotyledons longer than the radicle.

Species 150, almost all Australian, but introduced now in many parts of the world. The one planted so much at Ootacamund is *E. globulus* Lab.

The change in the position and shape of the leaves appears to be an adaptation to a dry climate, for vertically hanging leaves do not get so much sun in the middle of the day, its hottest time, as the horizontal ones proper to this family would. The leaf-stalk, which is then formed, not only is necessary if the leaves are to hang free of the branch, but enables the blades to give to the wind and not suffer as they would if attached stiffly like the young leaves. The stripping of the bark is unusual, and it seems to have at any rate this advantage that parasitic Loranthuses do not get a foothold as they do on the *Melanoxylon*, *Tea*, and other trees.

SYNCARPIA.

59 II.*

Turpentine tree.

Trees with the flowers coalescing in globular heads, the inferior ovaries joined in fruit into an irregular mass with hardly more than the round crater-like mouths of each flower showing.

Species 2 or 3 only, Australian.

Named from SYN with, and CARPON fruit in allusion to this:

Syncarpia glomulifera Sm. (= *S. laurifolia* Ten); III* 1. Leaves elliptic, about $3\frac{1}{2}$ inches by 1 inch, faintly and closely reticulate below, evergreen. Peduncles of the flower masses $1\frac{1}{4}$ inches, in the leaf-axils or at the end of short branches. Sepals four, persistent as hard triangular teeth round the crater-mouths of the fruit. Petals four, spreading. Stamens many, in one or two series, interrupted occasionally between the petals : filaments very slender : anthers versatile, opening by longitudinal slits.

Ovary three-celled, flat at the top with slight depression round the base of the slender style : stigma small : ovules many. Whole fruiting mass $\frac{5}{8}$ inch across, of four to seven dry fruits, each opening by valves at the top. Seeds minute, $\frac{1}{10}$ inch long, linear-cuneate : embryo straight, with cotyledons longer than the radicle. t. 107.

Pulneys : near Kodaikanal in the Gundan shola plantation. Nilgiris : garden of Ootacamund Club, Coonoor.

RHODOMYRTUS.

F.B.I. 59 VI.

A small genus chiefly remarkable for the tomentose young parts, three-nerved leaves, and ovary divided horizontally (as well as vertically) into one-seeded chambers. Trees or shrubs. Calyx-tube turbinate. Petals four to five. Stamens many, in several series : filaments free slender. Fruit a drupe-like berry of one-seeded cells or pyrenes in two to six superimposed series.

Species 5 or 6, nearly all inhabitants of east Australia ; our species widely distributed.

Rhodomyrtus tomentosa Wight ; F.B.I. ii 469, VI 1 ; Hill Gooseberry. A round topped bush. Branches downy and compressed towards the tips. Lower leaves often in threes, upper opposite, subsessile : blades elliptic or obovate, 2 by $1\frac{1}{2}$ inches (less or more), with three or five main veins. Flowers pink in small cymose axillary corymbs. Peduncles 2 inches, pedicels $\frac{1}{3}$ inch. Petals $\frac{1}{4}$ to $\frac{1}{2}$ inch, downy on the backs. Fruit globular, size of a cherry, dark purple : seeds compressed. t. 108 Wight Ill. t. 97 * f. 3 ; Sp. Nilg. t. 71.

Common on dry slopes. Nilgiris : eastern slope of the Snowdon-Dôdabetta ridge, abundant ; Kotagiri. Pulneys : on the open downs, not common ; but abundant lower, near Poombari. Fyson 263, 334. Bourne 111.

Gen. Dist. Mountains of South India, Ceylon, Malacca, Singapore.

The fruit is quite pleasant near Ootacamund and Kotagiri, on the Pulney downs it is much less so.

EUGENIA.

F.B.I. 59 VIII.

A very large genus of over 700 species, divided in *Gen. Plant.* into three sub-genera, considered by some distinct genera, *Jambosa* *Syzygium* and *Eu-eugenia*. All our wild species belong to the second, and the description which follows belongs more especially to it.

Large trees or shrubs, with opposite, simple and entire slightly scented leaves. Flowers in terminal cymose panicles, with short pedicels, small. Calyx-tube egg-shaped, the ovary quite immersed in it: sepals four or five short. Petals as many, round without any stalk; sometimes connected together and falling off as a whole. Stamens many in several series: filaments slender, curled down in bud: anthers versatile, small. Fruit a globular or oblong berry, with two seeds.

Species in this sub-genus about 100, most of them belonging to India and Malaya. The F.B.I. gives 76 for India alone.

Several species are cultivated for their fruits, buds, etc. as Clove, Rose Apple, Malabar Plum, Jambalam; *Fr.* Jambosier; *Ger.* Kirschmyrthe.

Leaves $2\frac{1}{2}$ by $1\frac{1}{4}$ inches elliptic acuminate, drooping. . .

Umbrella-tree *E. arnottiana*.

Leaves 4 by 2 inches elliptic obtuse, thick, stiff; twigs thick four-angled . . . , *E. montana*.

Leaves 1 by $\frac{3}{4}$ inch nearly round, close set, stiff
E. calophyllifolia.

Eugenia arnottiana *Wight, Herb. Prop.!*; *F.B.I.* ii 483, VIII 41; Umbrella tree of Ootacamund; distinguished among our species by its spreading habit, its bunches of red flower-buds or berries, and its limply drooping leaves.

Bark grey, smooth, usually well-covered with lichens; main branches spreading, crooked and bent. Leaves opposite or nearly so, when freshly opened pinkish-red and erect, but soon drooping; elliptic narrowed at the base to the $\frac{1}{2}$ inch stalk, and acute or acuminate at the

apex; with strong midrib and very close lateral nerves meeting in a marginal one very close to the edge; finely dotted both sides, hard and shining, coriaceous. Flowers nearly sessile, in terminal umbel-like cymes, with square branches 1 inch long: bracts soon falling. Calyx broad above, lobes four. Petals distinct, cream-coloured, in bud crimson. Stamens white, spreading stiffly. Berry $\frac{1}{3}$ inch by $\frac{1}{2}$ inch rather long-egg or urn-shaped, crowned by the sepals, purple when ripe, juicy but quite inedible. t. 109 & 110. Wight Ic. t. 999.

Nilgiri, Pulney and Anamalai hills; at higher elevations, one of the very commonest trees by the wayside or in sholas where it overtops most others. Pulneys: down to 5,500 feet. Not on the Bombay Ghats, nor elsewhere in India. Flowers in the winter months to April, in fruit during the summer. *Fyson* 641, 1815, 1816, 2215, 2216, 2637. *Bourne* 1092.

In the shola this tree has usually a reddish look at the top from either the numerous bunches of berries or the flush of young leaves; and the leaves always droop.

Eugenia montana Wight; *F.B.I.* ii 488, VIII 57; a large tree, distinguished from all other of our *Eugenia*s by the wings on the four edges of the youngest branches, especially in the flowering part; the branchlets also very ($\frac{1}{6}$ inch) thick, and the leaves larger than in other of our species, with stronger, not closely set veins. The foliage is distinctly lumpy.

One of the very largest of shola and way-side trees, the main trunk short, but thick: the branches spreading widely, very bent and crooked, with dull red-brown bark cracked like that of the Scotch Pine. Branchlets, smooth green, four-angled and winged. Leaves opposite or occasionally alternate, obovate or oblong-obovate, up to 6 by $3\frac{1}{4}$ inches, on short stout stalks of $\frac{1}{4}$ to $\frac{1}{2}$ inch channelled on the upper side; when mature dark dull green, dotted below, spreading flat; when young only slightly purplish coloured, erect: midrib channelled on

the upper side; nerves about $\frac{1}{5}$ inch apart (the alternate stronger), prominent on the under side, and meeting in an arched, irregular, marginal vein, often over $\frac{1}{8}$ inch from the edge. Flowers in dense cymose corymbs, on stout stalks in the axils of the uppermost leaves and leaf-like bracts $\frac{1}{2}$ to $\frac{3}{4}$ inch long, forming dense panicles: cyme branches all very stout, angled. Sepals four obtuse. Petals four united and falling as one piece. Fruit purple, crowned by the sepals. t. 111. Wight Ic. t. 1060.

Nilgiris: near Ootacamund and below to Pykara and Coonoor common. Young leaves in December, flowers soon after. *Fyson* 2726, 2016.

Eugenia calophyllifolia Wight; *Herb. Prop.*!; *F.B.I.* ii 494, VIII 86; distinguished among our *Eugenias* by its almost round, closely set and stiffly-erect, leaves.

A tree flowering when only 10 feet high, but becoming eventually one of the largest, 40 to 60 feet and overtopping all others in the shola. Branches with brown bark, when young square; often arising three or four together and almost umbelled as in *Pittosporum*. Leaf-stalks $\frac{1}{6}$ inch, blade broadly elliptic or obovate, obtuse or retuse at apex, acute at the base, very leathery, 1 by $\frac{3}{4}$ inch, or a little larger; with numerous nerves, more or less parallel but also reticulate below, ending in a hardly distinct marginal nerve; without pellucid dots; very hard and firm. Flowers in terminal cymose corymbs: peduncles $\frac{1}{2}$ to $\frac{3}{4}$ inch, green, rough but glabrous. Calyx conical, $\frac{1}{12}$ inch, with four short erect sepals. Petals round united and falling as one hemispherical piece, white. Stamens 16 inches curled up in bud, white. Style $\frac{1}{4}$ inch. Fruit erect, dark purple, $\frac{1}{2}$ to $\frac{3}{4}$ inch by $\frac{3}{8}$ to $\frac{1}{2}$ inch, juicy and edible. Seed one, cotyledons very thick. t. 112. Wight Ic. t. 1000.

Nilgiris: Snowdon, Ganapakkam above Pykara at 7,800 feet and similar spots, also river bank at Pykara 7,600 feet, flowering

in early January, the whole tree at once, for a day or two only. Apparently not on the Pulneys nor anywhere else but Ceylon, on Adam's Peak. *Fyson* 2213, 2599, 2711.

As a small tree remarkable for its dense mass of rather upright branches and close set erect leaves, as stiff as the Box, but in the shola on Snowdon and Ganapakkam near Pykara at 7,800 feet for its very flat top, pinkish in young leaf, below which are exposed rather bare spreading branches, with usually a dependent fringe of grey lichen. Rare except on higher exposed sholas where it takes the place apparently of *E. arnottiana*.

MELASTOMACEÆ.

Herbs or shrubs. Leaves opposite, with usually three, five or seven main nerves. Flowers showy. Anthers long and opening by pores at the ends not by slits, and having often outgrowths at the base. Ovary inferior: seeds small, escaping by holes in the top.

Species about 1,800 chiefly in the tropics of South America and Asia; a few also in Africa and Polynesia.

The genus *SONERILLA*, delicate herbs with trimerous flowers occurs at lower levels and occasionally in gardens. *TIBOUCHINA* (*PLEROMA*) is grown in gardens. All common wild members of the family are *OSBECKIAS*.

OSBECKIA.

F.B.I. 60 I.

Mostly woody plants, shrubs of 2 to 10 feet, with purple flowers, conspicuously long and pointed bright yellow anthers curving downwards from the tops of the filaments, and very bristly calyx-tube, which as in all the family encloses the ovary and fruit. Leaves opposite, shortly stalked: blades with five to seven main veins starting at the base and curving forwards to meet in the tip: joined by numerous straight cross veins; but with no ordinary network. Stamens all equal: filaments with a pair of small yellow swellings just below the anthers (distinction from the native *MELASTOMA* and the garden *TIBOUCHINA* or *PLEROMA*). Ovary entirely enclosed in the calyx-tube, and opening by four or five holes in the flat top. Seeds curved, minutely punctate.

An eminently Indian genus, nearly all of the 30 species being confined to this country, most of them to the hills.

Some or all of the bristles of the calyx-tube are combs pointing upwards on short stalks, and the number and nature of these, whether covering the whole calyx or only towards the top, are important characteristics of the several species.

Almost herbaceous : petals four, white with purple patches.

O. cupularis.

Shrubs, with purple flowers :—

Leaves silky underneath : bristles of calyx mostly simple.

O. wightiana.

Branches reddish : bristles of calyx stalked. O. leschenaultiana.

Large shrub : bristles of calyx large : cross veins close.

O. reticulata.

Osbeckia cupularis Don ; *F.B.I.* ii 514, I 2 ; a small plant, growing in grass, with slender yellowish branches and white flowers blotched with pink on the outside.

Herbaceous from a perennial rootstock. Bark thin and scaly ; stem and younger branches four-angled, yellowish and hirsute with erect hairs, as also the upper surface of the leaves and the veins on the under side. Leaf-stalk $\frac{1}{10}$ to $\frac{1}{8}$ inch ; blade $\frac{1}{2}$ inch, ovate-elliptic, drying yellowish, with three to five nerves curving from base to apex. Flowers in close bunches on tall slender branches with a pair of leaves just below. Calyx $\frac{1}{4}$ inch, deep red inside and partly on the outside too, with bristles of the lower half simple of the upper comb-like ; teeth four, about $\frac{1}{10}$ inch, alternating with long-stalked tufted or comb-bristles and ending each in a few long hairs. Petals four, spreading, white with blotches of pink on the outside. Stamens eight : their filaments slender, white : anthers $\frac{1}{16}$ inch. Fruiting calyx-tube $\frac{1}{3}$ by $\frac{1}{5}$ inch, campanulate, nearly white and at length glabrous ; mouth $\frac{1}{8}$ inch across, encircled by a fairly wide band : capsule inside opening by four holes and not protruding above the mouth. t. 113. Wight Ic. 996 (*O. leschenaultiana*).

Quite common in long grass, near sholas; flowering when the first rains begin. Pulneys: on the downs near Kodaikanal, Nilgiris: Ootacamund downs. *Fyson* 536, 1128, 2168. *Bourne* 23, 67.

Gen. Dist. Mountains of South India and Ceylon.

Osbeckia wightiana *Benth.*; *F.B.I.* ii 519, I 17; distinguished by its silky leaves, white on the under side; calyx shaggy with simple hairs not stalked comb-bristles and handsome flowers.

A well branched shrub 4 to 8 feet high; younger branches rough with short stiff hairs or their semi-persistent bases; youngest very hairy. Leaves ovate-oblong, 2 by $\frac{3}{4}$ inch ($1\frac{1}{2}$ to 3 by $\frac{1}{2}$ to $1\frac{1}{2}$ inches), closely covered with short silky hairs. Flowers one to five clustered, nearly sessile: bracts $\frac{1}{3}$ by $\frac{1}{4}$ inch, ovate-acute, silky. Calyx-tube $\frac{1}{3}$ inch, covered thickly with straight hairs $\frac{1}{8}$ inch long, and in the upper part from stalked scales. Corolla $1\frac{3}{4}$ to 2 inches, purple, handsome. Anthers $\frac{1}{3}$ inch. Style 1 inch, prominently curved, and thickened at the stigma. Fruits in short racemes, marginal teeth strongly ciliated. t. 114. *Wight* Ic. t. 998.

Pulneys: on the Kodaikanal downs and down to 4,000 feet at Poombari. Nilgiris: Kotagiri and below. *Fyson* 1770. *Bourne* 56, 288, 860. *

Gen. Dist. South India and Ceylon.

The plant is very hardy, growing to 8 feet on what appears to be almost bare rock.

Osbeckia leschenaultiana *DC.*; *F.B.I.* ii 520, I 18; Red *Osbeckia*; distinguished from the other purple flowered species by its smaller habit and narrower leaves.

Branchlets square; older roundish, with two opposite pairs of ridges decurrent from the leaves; covered with spreading hairs. Leaves sessile, $\frac{3}{4}$ to $1\frac{1}{4}$ by $\frac{3}{8}$ to $\frac{5}{8}$ inch, ovate, narrow or broad, acute, sparsely hairy on both sides, but more so on the nerves of the lower

nerves three and a much fainter marginal pair. Flowers in dense tri-chotomous heads: pedicels $\frac{1}{8}$ inch. Calyx-tube densely clothed with brown stalked bristles. Corolla $1\frac{1}{2}$ to 2 inches, purple. Petals five. Filaments $\frac{1}{2}$ inch, anthers $\frac{1}{4}$ inch, acuminate. Fruiting calyx $\frac{1}{3}$ by $\frac{1}{5}$ inch, thickly set with comb-bristles with stalks of $\frac{1}{20}$ inch, and bristles nearly as long. Ovary five-celled; openings ciliate with simple hairs of $\frac{1}{20}$ to $\frac{1}{12}$ inch. t. 115. Wight Ic. t. 997 (*O. gardneriana*), not Ic. t. 996.

In damp exposed places flowering December to June. Nilgiris: Pykara. *Fyson* 1100, 2169, 2560.

Gen. Dist. Nilgiris only.

***Osbeckia reticulata* Beddome**; *F.B.I.* ii 520, I 20; Giant *Osbeckia*; a small tree, distinguished by the very shaggy branchlets, the large shaggy or silky leaves, with an immense number of cross-veins joining the seven main ones, and the coarse comb-scales which completely cover the calyx-tube.

Height 4 to 10 feet. Young branches four-angled covered with closely appressed hairs and at the nodes shaggy. Leaves ovate-lanceolate, or ovate, $1\frac{1}{2}$ to $2\frac{1}{2}$ by $\frac{3}{4}$ to $1\frac{1}{2}$ inches, but in the shade and on young shoots reaching five by three inches; with seven main nerves and numerous almost horizontal cross-veins, $\frac{1}{16}$ to $\frac{1}{8}$ inch apart; densely covered with long silky hairs between the veins on the upper side, and on the veins of the lower: stalk $\frac{1}{4}$ to $\frac{1}{2}$ inch shaggy. Flowers large in umbellate clusters of three or four at the ends of the branches, their stalks $\frac{1}{4}$ inch long, joined across the branch by a line of bristles. Calyx-tube $\frac{3}{8}$ inch, nearly hemispherical, densely clothed by bristly scales: lobes oblong obtuse, $\frac{1}{5}$ inch, contorted and overlapping to the left, ciliate and tipped each by a large stellate hair, and with a very densely tufted comb-scale between each

two, but soon falling and leaving a truncate mouth. Stamens large, the anthers $\frac{3}{8}$ inch long, with two small semi-circular flap-like appendages at the base.

Near and in sholas and by road-sides. Pulneys : flowering May, a distinctive feature of some of the roads of Kodaikanal. *Bourne* 12, 930, 1352.

Gen. Dist. Also Anamalais (where first collected by Col. Beddome).

TIBOUCHINA.

F.B.I. 60 O.*

Tibouchina semicandra Cogn. (*Pleroma* of Triana); O * 1; planted in gardens, e.g., churchyard in Ootacamund; has the leaves of *O. reticulata* but the calyx-tube covered with simple erect hairs, not comb-bristles; and the anthers with two appendages near the base. *Bot. Mag. t.* 5721.

A native of Brazil, and known as Brazilian Spider Flower. *Ger. Thee-elpe.* *Bourne* 5116.

MEMECYLON.

F.B.I. 60 XXI.

Trees with quite small flowers in axillary bunches. Calyx-tube dilated, hardly lobed. Petals four, blue or white. Stamens eight with long filaments, short anthers opening by slits in front, and a horn-shaped prolongation of the connective behind. Ovary one-celled, its top with eight radiating grooves. Fruit a one-seeded, globose or oval, berry.

Species about 100 in south-east Asia, tropical Africa, and a few in Polynesia and Australia.

Memecylon amplexicaule Roxb. var *malabarica*; F.B.I. ii 559, XXI 24. Leaves 2 to 3 inches, ovate, sessile or stalked: nerves very obscure. Umbels of flowers sessile. Fruit $\frac{1}{4}$ inch. *Wight Ic. t.* 279.

Pulneys : in the large shola in Kodaikanal. *Bourne* 931.

Roxburgh's plant was from Penang.

LYTHRACEÆ.

Tribe—AMMANNIÆ.

Small often aquatic herbs with opposite entire exstipulate leaves and the ovary free in the membranous deeply hollowed calyx-tube.

The family LYTHRACEÆ is a medium sized one of 200 to 300 species and includes LYTHRUM (*L. salicaria* the Purple Loosetrife); LAGERSTRÆMIA, (*L. Flos-reginæ* and *L. indica* common in Madras gardens); and the Pomegranate.

ROOTALA.

Part of AMMANNIA.

F.B.I. 61 I.

Small herbs with opposite leaves distinguished among other nearly allied genera and from the rest of AMMANNIA by the capsule splitting septicidally into its constituent carpels which have cartilaginous walls showing under strong magnification numerous close horizontal striæ. Sepals and petals four to six: stamens one to six: ovary one-celled at the top: seeds few, not winged.

Species about 38, mostly in the warmer parts of Asia (21) and Africa (17); also in Australia and central Europe.

The genus is a Linnæan one, combined later with AMMANNIA, but again separated. See Engler's *Pflanzenreich* IV, 216 *Lythraceæ*, s. 40.

Ammannia rotundifolia Hamilton; *F.B.I.* ii 566, I 3; a small herb growing by the waterside, with opposite leaves $\frac{1}{2}$ inch long, and dense terminal spikes of small pink flowers in the axils of green bracts.

Stem often creeping at the base, 3 to 8 inches. Leaves $\frac{1}{2}$ to $\frac{1}{5}$ inch long and a little narrower, subsessile, round or obovate, very obtuse, penninerved. Racemes terminal, dense bracts green, $\frac{1}{12}$ inch, broadly ovate acute, adnate to the pedicel: bracteoles very narrow. Calyx $\frac{1}{10}$ to $\frac{1}{8}$ inch long and broad, membranous, with four triangular teeth. Petals four, obovate twice as long as the tube,

attached to it between the teeth. Anthers round. Fruit a septicial capsule showing when ripe very close and fine horizontal striations. Wight. Ic. t. 258.

On the margin of the lake at Kodaikanal, very abundant. In damp places generally on the Kodaikanal and Ootacamund downs. *Fyson* 1239, 2897. *Bourne* 4607, 5210.

Gen. Dist. India, Ceylon, Malacca, South China, Formosa, etc.

ONAGRACEÆ.

Herbs with opposite or alternate undivided but toothed leaves and mostly solitary flowers, characterised by the inferior ovary of two or four cells: sepals and petals two or four and stamens two, four, or eight.

Species 300 to 400 all over the world but especially in the north temperate zone.

Common garden and wild European plants are *FUCHSIA* *CLARKIA*, *ÆNOTHERA*, *EPILOBIUM* (Willow herb), *CIRCÆA* (Enchanter's Nightshade)

ÆNOTHERA.

Evening Primrose.

Herbs with erect stems well clothed with alternate simple but often much cut leaves. Flowers terminal, solitary, often large; with very long calyx-tube continued as a tube above the ovary in long sepals; four very thin petals, twisted in bud; eight stamens with long conspicuous anthers; a four-celled ovary containing many seeds, and four long narrow spreading stigmas (§ *Ewænothera*). Fruit a four-angled or four-winged capsule opening by four valves.

The extra-tropical species were monographed by S. Watson in *Contrib. Amer. Bot. I. p. 573.* As given in the *Gen. Plant* the genus has over 200 species, nearly all in America, outside the tropics. In science the genus has become famous because of a theory of evolution which De Vries founded mainly on the great variations in a species which has run wild in Holland. These *mutations* as he called them, were he considered differences of sufficient importance to warrant the plants being considered

new species, and mainly on this evidence, but with that of other mutations too, he founded his theory of evolution as being brought about, not by the slow accumulation of small (fluctuating) variations as C. Darwin suggested, but by big changes which once made do not vary back to the original form. His theory has been vigorously opposed by the older followers of Darwin, particularly Alfred Russell Wallace. Many however of those who have worked on and support Mendelian methods in the study of inheritance are inclined to support him.

C. odorata Jacq. Flowers yellow scented at night. t. 116. *Fyson* 3025.

C. tetraptera Cav. Flowers white 2 inches; capsule winged. t. 117. *Fyson* 283. *Bourne* 702.

C. rosea Ait. Flowers pink, 1 inch. *Fyson* 285.

FUCHSIA.

62 III.*

Herbs shrubs or small trees with pendent usually reddish or purple flowers solitary in the leaf-axils, remarkable for the very long calyx-tube carrying the four sepals, four petals and eight stamens well beyond the ovary. Style single with capitate or lobed stigma. Fruit a berry.

Species 60, natives of Mexico and the western side of South America; one or two also in New Zealand. Much cultivated in English gardens.

Fuchsia fulgens Moçino et Lessé; III * I. A coarse shrub with opposite leaves, and terminal racemes of magenta-red flowers, with calyx-tube of $2\frac{1}{2}$ to 3 inches. t. 118.

Common on road-sides in Ootacamund: introduced as a garden plant. *Fyson* 2217.

CIRCÆA.

F.B.I. 62 IV.

Small herbs with alternate ovate or sinuate or toothed leaves, and small flowers of two sepals, two petals, two stamens, and one or two cells to the ovary, each with one seed only.

Species under 10, in Europe, Asia, temperate and arctic North America.

Circæa alpina Linn.; *F.B.I.* ii 589, IV 3; Enchanter's Nightshade. Stem 2 to 6 inches, pubescent or nearly glabrous, seldom branched below the racemes. Leaves $\frac{3}{4}$ to $1\frac{1}{4}$ inches, sinuate-serrate, cordate or abruptly narrowed at the base; lower leaf-stalks longer, upper shorter than the blades. Racemes short, long peduncled, 2 to 6 inches. Flowers $\frac{1}{8}$ inch. Fruiting pedicels stiffly horizontal; fruits $1\frac{1}{2}$ inches, obovoid, covered with hooked hairs. Wight Ill. t. 101.*

In woods and shady places. *Fyson* 2076. *Bourne* 936.

Gen. Dist. Temperate climates of the northern hemisphere. (*Ger.* Hexenkraut, *Fr.* Herbe de S. Etienne.)

The flowers face downwards and are visited by small hovering flies. To get the honey secreted round the base of the style they must hold on to the stamens and style. The latter being the longer is touched first and so receives pollen from the underside of the insect's body. Later on the visitor, in sucking the honey catches hold of the stamens and rubs against the anthers. Self-pollination would occur by the bending of a stamen against the stigma. (*Koerner.*)

SAMYDACEÆ.

A small tropical family the SAMYDACEÆ allied to the Passion-flower, Papaw, Begonia, and Melon, but differing from these in its two-ranked or bifarious gland-dotted leaves, small clustered flowers, persistent sepals, and by the large fleshy lacerate aril of the seeds.

CASEARIA.

F.B.I. 63 I.

Species 80 in warm climates especially of America.

Casearia esculenta Roxb.; *F.B.I.* ii 592, I 4; a tree with yellowish-white smooth bark, obovate gland-dotted leaves, and small groups of nearly sessile petal-less flowers close down in the leaf-axils or berry-like orange yellow fruits, $\frac{3}{4}$ inch long, which stand on a frill of the persistent sepals.

Tree, 20 feet or more high, branches glabrous. Leaves standing to right and left (bifarious though spirally arranged), elliptic or obovate, entire, acute

or acuminate, tapering to the base, thick, dotted with translucent dots and streaks; petiole $\frac{1}{4}$ inch, blade 2 to $3\frac{1}{2}$ inches by 1 to 2 inches. Flowers in the axils of the present or fallen leaves pedicels $\frac{1}{8}$ inch. Calyx $\frac{1}{10}$ inch, glabrous, with four to five round, concave lobes. Stamens eight, with minute, round anthers; mixed with shorter oblong staminodes, villous at the top. Ovary one-celled, with one very short style: ovules many on parietal placentas. Fruit orange-yellow, glabrous, their $\frac{1}{5}$ inch stalks jointed near the base and marked there by a raised ring; at first fleshy, but opening when dry in three thick valves. Seeds many, covered by a large red fleshy and lacerate aril.

Kodaikanal downs in Gundattu shola probably planted.
Bourne 937.

Gen. Dist. On the Western Ghats from Bombay southwards, Ceylon, and the Malaya peninsula.

Vernacular name, *Vella Kunnan*, Malayalam; *Mori Mar*.

PASSIFLORACEÆ.

A family of some 300 species the greater number belonging to the genus.

PASSIFLORA.

F.B.I. 64 I.

Passion-flower.

Shrubs or herbs, twiners or tendril-climbers. Leaves simple, entire or lobed, stipulate, stalked. Flowers solitary or in cymes peduncled in the leaf-axils, with three bracteoles. Sepals, petals and stamens five. Ovary and stamens borne on a stalk well above the rest, and this stalk surrounded at the base by a single or double corona, composed of a membranous cup and a ring or rings of slender filaments. Anthers oblong, unusually large, versatile. Ovary one-celled, with three parietal placentas: style with three branches. Fruit a berry.

A large genus, natives mostly of America; a few also in Asia and Australasia.

- | | | | |
|---|---|---|-------------------|
| a | { | Leaves entire, half-moon shaped | P. leschenaultii. |
| | { | Leaves three-lobed | b |
| b | { | Lobes entire: stipules $\frac{3}{4}$ inch | P. calcarata. |
| | { | Lobes toothed or crenate: no stipules | P. edulis. |

Passiflora leschenaultii DC.; *F.B.I.* ii 599, I 1; Moon Passion-flower, Indian name Covayonkou. Leaves semi-circular attached at the middle of the rounded margin with a cuspidate point in the opposite side, glabrous: stalk $\frac{1}{2}$ inch: nerves five all from the base, the three middle ones very straight to the opposite centre and corners. Tendrils axillary. Peduncles in pairs in the leaf-axils, $1\frac{1}{2}$ to 2 inches, jointed $\frac{1}{2}$ to $\frac{1}{3}$ below the flower: bracteoles three, linear. Sepals $\frac{3}{4}$ inch, oblong obtuse. Petals as long, but narrower, white. Outer corona of two rows of linear filaments, the outer row shorter than the petals, the inner much shorter and more slender. Inner corona a much folded membranous cup; and inside this again a small shallow cup round the base of the column. Fruit ovoid $1\frac{1}{2}$ inches. t. 119. Wight Ic. t. 39.

Common, climbing on the outer trees of a shola. Pulneys: near Kodaikanal. Nilgiris: Ootacamund, Kotagiri, Coonoor, etc. *Fyson* 1040, 1767. *Bourne* 938.

Gen. Dist. Also Khasia.

Passiflora calcarata Mast.; I 2; Madagascar Passion-flower; a slender climber with three-lobed leaves and large stipules $\frac{3}{4}$ to 1 inch by $\frac{1}{2}$ inch which distinguish it at once from all our others. Leaf-stalks $\frac{3}{4}$ inch, with one, two, or more, small outgrowths curving slightly forwards, at about half-way: lobes of leaves entire except for a few small teeth at the bottom of the divisions, the lateral lobes slightly shorter than the middle one. Pedicels longer, curving so that the flower faces upwards, and

bearing three ovate bracts, $\frac{1}{5}$ inch below the flower. Calyx-tube $\frac{1}{3}$ to $\frac{2}{3}$ inch wide by $\frac{1}{8}$ to $\frac{1}{4}$ inch deep (long): sepals $\frac{3}{4}$ by $\frac{1}{3}$ inch, green imbricate, with a spur or horn, $\frac{1}{4}$ inch long a little below the end. Petals hardly as long, oblong obtuse, pure white but for the greenish midrib. Corona, an outer set of slender filaments, white with purple base and blue tips; and an inner set of much shorter ones which fit closely round the central column and cover a honey-secreting circular channel formed by the dipping downwards of the calyx-tube. Ovary egg-shaped green with a slight bloom: stylar arms spreading upwards and outwards, and ending in large two-lobed stigmas. t. 120.

A garden escape. Nilgiris: near Ootacamund and Neduvattum. Flowering March to May. *Fyson* 1695.

A native of Madagascar belonging to the section *GRANADILLA* of the genus.

Passiflora edulis Sims.; I 4; edible Passion fruit; a native of Brazil has gone wild below Kodaikanal and near Ootacamund. t. 121. Bot. Mag. t. 1989.

CUCURBITACEÆ.

Melon, Marrow, Pumpkin, Bryony, etc.

Weak stemmed, often scabrid herbs, climbing by tendrils, which may be simple or branched and usually spring from a little to one side of a leaf-axil. Leaves stalked, lobed but not compound. Flowers white or yellow, unisexual, monœcious (both kinds on the same plant) or diœcious. Petals often quite united. Stamens typically five; more often apparently only three, two having two anthers each (i.e., a pair fused), one single: anthers rigid on the filaments, straight or doubled in an "S" curve. Ovary inferior, one-celled with three parietal placentas. Fruit a berry with firm rind and enlarged juicy placentas: seeds many, flat.

Species about 400, mostly in the warmer parts of the world especially the tropics. The family has been put by many systematists among the Monopetalæ, because of the often quite typically monopetalous flower not unlike that of a CAMPANULA.

MELOTHRIA

F.B.I. 65 XVII.

Including ZEHNERIA.

F.B.I. 65 XVI.

Slender and weak stemmed herbs. Flowers small white or yellow, monœcious or diœcious. Male flowers in racemes or corymbs. Calyx campanulate with five short teeth. Corolla deeply five-partite, petals not toothed. Stamens three: anthers usually free, oblong or suborbicular, free. Female flowers solitary, fascicled or corymbose. Calyx and corolla as of the male. Staminodes three. Ovary egg-shaped, globose or pear-shaped. Style short, surrounded by an annular disc. Fruit a small berry. Seeds usually margined.

Species about 40 all in the tropics.

Very similar to BRYONIA White Bryony, *Fr.* Couleuvrée, *Ger.* Zaunrübe. Black Bryony is quite distinct.

Melothria perpusilla Cogniaux; *F.B.I.* as *Zehneria hookeriana Arn.*, ii 624, XVI 2; Kodai Bryony.

Stem slender herbaceous: tendrils from one side of the leaf-stalks. Leaves angular, sharply lobed. Flowers in small corymbs, peduncled in the leaf-axils: pedicel $\frac{1}{8}$ inch; peduncle $\frac{1}{4}$ to $\frac{1}{2}$ inch: female flowers $\frac{1}{4}$ inch, male flowers $\frac{1}{5}$ inch, crowded. Fruit globose. t. 122.

In thickets and sholas, common on the downs. Pulneys: as high as Kodaikanal and above. Nilgiris: Pykara, Kotagiri. *Fyson* 328, 1797, 1859, 2940. *Bourne* 1, 32, 947.

Gen. Dist. Mountains of South India, south-east and central Himalayas, Assam, Khasia to Sikkim and Nepal.

I am a little doubtful about the inclusion of our plant in this species. In habit it is more like *M. punctata* of South Africa.

Trichosanthes palmata Roxb.; *F.B.I.* ii 606, II 1. Remarkable for the long, fimbriate, petals; may occur at Ootacamund, but belongs to lower levels. *Fyson* 1359.

Gen. Dist. Himalayas to Ceylon, Japan and north Australia.

UMBELLIFERÆ.

A large family characterised chiefly by the flowers being in compound umbels (umbels of umbels), with inferior ovary which always splits into two one-seeded parts (mericarps). Herbs usually strongly scented, with hollow stems. Leaves nearly always much dissected or compound, and with large sheathing base. Sepals small or none. Petals folded down the middle, notched. Stamens five. Styles two. Mericarps with five ridges and sometimes others between them, and in the valleys between long oil cavities (vittas).

Species 1,300 mostly in the temperate regions of the Old World. Absent from North America and south of the Line.

HYDROCOTYLE and SANICULA have simple umbels and no vittas in the fruit, and are removed by some systematists into a family of their own. For distinguishing the genera importance is attached to the presence or absence on the mericarps of secondary ridges between the main ones; on the number of vittas between the ridges; and on the shape of the fruit and mericarps, whether these are widest at the split and flat; or equally thick as wide; or narrowest at the split and therefore flattened at right angles to it.

HYDROCOTYLE.

F.B.I. 70 I.

Pennywort.

Small herbs prostrate and rooting at the nodes. Leaves long stalked with small scarious stipules, roundish angular or lobed, cordate (or slit behind the point of attachment), palmately nerved. Umbels simple, small. Flowers white. Fruits compressed at right angles to the plane of division, i.e., splitting faces narrow: no vittas.

Species about 70 in wet and damp places, especially in the southern hemisphere. A few in Europe: Pennywort, *Ger.* Wassernabel.

- | | | | |
|---|---|---|------------------|
| a | { | Leaves $\frac{1}{4}$ inch | H. rotundifolia. |
| | { | Leaves 1 inch kidney-shaped | H. asiatica. |
| | { | Leaves 1 inch or more deeply cordate, lobed and toothed. b | |
| b | { | Umbels on peduncles of $\frac{1}{2}$ inch or more | H. javanica. |
| | { | Umbels on peduncles of $\frac{1}{8}$ inch only | H. conferta. |

Hydrocotyle javanica *Thunb.*; *F.B.I.* ii 667, I 1. Stem succulent, pubescent below the nodes, with erect branches up to 6 inches. Leaves $1\frac{1}{2}$ to 4 inches, nearly circular, with five to nine triangular lobes, these again five- to seven-lobed or crenate; hairy above on the veins only, pubescent underneath: stipules entire: stalks on the prostrate stem up to 10 inches, on the erect branches 1 to 2 inches. Flowers small, pale green, nearly sessile and crowded on very slender peduncles of $\frac{1}{2}$ to 1 inch, fascicled in the leaf-axils. No sepals. Petals with incurved tips. Fruits $\frac{1}{16}$ by $\frac{1}{12}$ inch broader than long; mericarps compressed, with five primary but no secondary ridges. t. 123. Wight Ic. t. 1003.

In shady places and woods on the downs. Pulneys: Kodaikanal. Nilgiris: down to 4,000 feet. *Fyson* 565, 1102. *Bourne* 152, 951, 1097.

Gen. Dist. Mountains of India and Ceylon, Burma. Absent or very rare on the Bombay Ghats to the north of us.

Hydrocotyle conferta *Wight*; *Kew Dist. No.* 11581; *F.B.I.* ii 668, I 3. Very similar in general appearance to *H. javanica*, but peduncles in fruit quite short $\frac{1}{8}$ to $\frac{1}{4}$ inch; mericarps smooth not compressed, in section pentagonal; stem more slender. t. 124. Wight Ic. t. 1002.

Pulneys: below Kodaikanal and down to 5,000 feet. Nilgiris: in Ootacamund. *Fyson* 269. *Bourne* 952, 2016, 4645.

Gen. Dist. ? Not elsewhere.

Hydrocotyle rotundifolia *Roxb.*; *F.B.I.* ii 668, I 4; Small Pennywort. Stems slender. Leaves $\frac{1}{4}$ to $\frac{3}{8}$ inch, deeply divided into five to seven lobes each with two or four rounded teeth. Umbels peduncled.

Common on bare damp black soil, in the open. Everywhere on the downs. *Fyson* 1131, 2949. *Bourne* 1479, 1096.

Gen. Dist. Mountains of India and Ceylon and Malaya.

Hydrocotyle asiatica *Linn.*; *F.B.I.* ii 669, I 5; Kidney leaf. Rootstock vertical stout, 3 to 4 inches.

Stem wiry, rooting at the nodes : stipules adnate to the leaf-stalks. Leaves kidney-shaped ? $\frac{3}{4}$ by 1 to 1 by $1\frac{1}{2}$ inches, or larger in the shade, with round crenulations. Peduncle $\frac{1}{2}$ inch : no pedicel. Flowers few in the umble, pink : bracts ovate-concave, two to an umbel. Ripe mericarps $\frac{1}{8}$ inch, showing both primary and secondary ridges. Wight Ic. t. 565.

On bare, even gravelly, soil and in grass ; in the opens very common. *Fyson* 1700. *Bourne* 953, 1478.

Gen. Dist. Throughout India and tropical and sub-tropical countries generally.

SANICULA.

F.B.I. 70 III.

Erect herbs characterised by the umbels irregular and globular, not flat-topped, and the fruits covered with hooked bristles.

Species 30. Europe, Asia, Atlantic and Pacific sides of North America, Mexico, Chili, highlands of tropical Africa, the Cape, Sandwich island. *Ger.* Heilknecke.

Name said to be from the Greek SANO, I heal, because of its medicinal properties.

Sanicula europæa Linn. ; F.B.I. ii 670, III 1 ; Wood Sanicle. Rootstock perennial. Radical leaves on long stalks, three-foliate : leaflets ovate-lanceolate acute, serrate or bristle-toothed, thin, glabrous. Stems 1 to $1\frac{1}{2}$ feet, leafless or with small three-fid bracts at the branchings. Flower-heads in groups of about three, sessile at the forkings and at intervals on the branches of a broadly spreading cymose panicle. Fruits covered with long hooked bristles. Wight Ill. t. 117 fig. 2 ; Ic. t. 334 and 1004.

In shady places, sholas, etc. Pulneys : near Kodaikanal and down to 5,500 feet. *Fyson* 982, 1113, 1424. *Bourne* 181.

Gen. Dist. Higher mountains of India and Ceylon ; not on the lower hills nor on the Bombay Ghats.

BUPLEURUM.

F.B.I. 70 VII.

Hare's-ear.

A genus remarkable in this family for its entire and for the most part grass-like leaves. Mericarps not compressed, with no secondary ridges, and with one to three vittas in the valleys.

Species 60 in the temperate regions of the Old World. One in South Africa, one in Arctic North America. In Europe we have Hare's-ear, Thorowax; *Ger.* Hasenohr.

Leaves 4 to 10 by $\frac{3}{4}$ to 1 inch *B. plantaginifolium*.

Leaves 2 to 6 by $\frac{1}{4}$ inch or more. . . . *B. mucronatum*.

Leaves $\frac{1}{2}$ to 2 by one-sixteen to $\frac{1}{8}$ inch, grass-like.
B. distichophyllum.

Bupleurum plantaginifolium *Wight*; *F.B.I.* ii 675, VII 1; Giant Hare's-ear. A tall perennial herb, with stem towards the top, where all the leaves are, as thick as a stout lead-pencil; base bare. Leaves with broad base half encircling the axis, then narrowed and widening gradually into the blade, which may be 10 inches long and over 1 inch wide; oblong-lanceolate, acute at both ends, strongly mucronate, with prominent midrib and five to eight slender nerves starting from near the base, and running at a very acute angle to meet the margin near the apex; upper leaves crowded, shorter to ovate, obtuse but mucronate, with much less distinct midrib. Umbels in branched panicles, with conspicuous elliptic mucronate bracts at the forkings: bracts of the umbels four to five, $\frac{1}{4}$ inch, three to seven-nerved, oblanceolate, mucronate: pedicels $\frac{1}{4}$ inch. Petals yellow, reflexed. Mericarps $\frac{1}{4}$ to $\frac{3}{8}$ inch by $\frac{1}{16}$, to $\frac{1}{8}$ inch, prominently five-ribbed, slightly curved towards the inner, flatter, side. t. 125. (b) an unripe fruit. *Wight* *lc.* t. 281.

Nilgiris: near Ootacamund on Snowdon, Elk Hill, etc. Fruiting in July; Coonoor. Not collected on the Pulneys. *Bourne* 4635.

Gen. Dist. Not elsewhere.

Bupleurum mucronatum *Wight and Arnott ; F.B.I. ii 676, VII 8* ; common Hare's-ear. A slender green stemmed, sometimes tall and well branched herb, with narrow grass-like erect leaves and terminal panicles of yellow-flowered umbels. Fruits with five prominent ridges, and in the furrows one to two vittas.

Gen. Dist. Mountains of South India and Ceylon.

* *type* : *Herb. Wight Prop.* 1197 ! Stem usually 2 feet, but may be as tall as a man and much branched. Leaves 2 to 7 inches by $\frac{1}{4}$ inch, linear oblong or oblanceolate, mucronate. Bracts of the umbellules narrow, acute. Fruits black. t. 126.

Pulneys : on the open downs frequent. Nilgiris. *Fyson* 348, 1122, 2042, 2100. *Bourne* 954, 2638, 4630.

** *var ramossima* *Wight ; Herb. Prop.* 1198. Stem $\frac{1}{2}$ inch thick with prominent ridges at the nodes, excessively branched upwards. Leaves comparatively short and broad, 1 to $2\frac{1}{2}$ inches by $\frac{1}{6}$ to $\frac{1}{3}$ inch, but also 4 by $\frac{1}{3}$ inch oblanceolate, obtuse, mucronate. Main peduncles of the umbels $\frac{1}{2}$ to 1 inch, slender ; secondary peduncles $\frac{1}{4}$ to 1 inch filiform : involucral bracts prominently oblanceolate mucronate. Fruit $\frac{1}{6}$ inch. *Wight Ic.* t. 1007.

Nilgiris : near Ootacamund. *Bourne* 5259.

*** *var virgatum* ; *Herb. Wight Prop.* 1165 (*from Ceylon*). Stem simple or nearly so below, twiggy. Leaves about $\frac{1}{8}$ inch by 2 inches. Rootstock a tuber, 1 inch thick. Fruit markedly ellipsoid, often $\frac{1}{8}$ inch only.

In grass on the Kodaikanal downs, near Gundattu shola, Lidcot valley and the road to Lone Cottage. *Bourne* 154, 954,* 955.

Bupleurum distichophyllum *Wight and Arnott ; Herb. Wight Prop.* 1196 ! ; *F.B.I. ii 677, VII 9*. Stem slender 4 to 8 inches. Leaves narrow, 1 to 2 inches,

grass-like mostly crowded and closely imbricated clasping the lower part of the stem, which may be there $1\frac{1}{12}$ inch thick; upper few, smaller and merging into the $\frac{1}{3}$ inch bracts. Bracts of umbels $\frac{1}{4}$ inch finely acuminate, longer than the rays. t. 127. Wight Ic. t. 1006.

On the open downs: Nilgiris at Ootacamund (*Bourne*) flowering July, and below Avalanche. Pulneys: above Kodai-kanal.

Gen. Dist. These hills only. *Fyson* 1839a. *Bourne* 4624.

PIMPINELLA.

F.B.I. 70 XIII.

Our two species distinguished from all others of the family by the large heart-shaped basal leaves, with stalks of four to twelve inches. (Most of the genus however with much divided leaves.) Stem slender. Lower leaves occasionally lobed: but upper bractiform leaves deeply cut or divided into three to five wedge-shaped segments with long clasping base. Umbels compound (of the usual type): peduncles about $\frac{3}{4}$ inch, bracts linear $\frac{1}{3}$ inch. Flowers white, $\frac{1}{8}$ inch across or less: petals slightly unequal. Mericarps narrowest across the division, contracted above, bulging below so that the pair appear in side view heart-shaped, each with five ridges and two or three oil ducts in the shallow furrows.

The above refers to our two species. The differences between them lie in the texture and tothing of the leaves (more pronounced in the upper ones), and the hairiness of the fruit. They may also be distinguished on the Pulney downs by the fact that *P. candolleana* grows on the open hill-side, *P. leschenaultii* in the cooler damper parts near sholas. But on the Ootacamund downs a small form of *P. leschenaultii* grows on the open hill-side.

Species 75, all over the world except Australia. (In Europe Burnet Saxifrage, Anise.)

Pimpinella leschenaultii DC.; F.B.I. ii 687, XIII 13.

* *Pulney form.* Stem often branched 2 to 5 feet high, red in the lower parts and clothed with fairly long white

hairs, which are conspicuous also on the leaf-stalks. Leaves somewhat flaccid, spreading, more or less hairy, with irregular and blunt teeth; the lowest entire, but often some three-lobed or three-foliate. Upper bractiform leaves palmately three-fid; the segments again divided, and these again bluntly toothed. Peduncles rather under $\frac{3}{4}$ inch. Filaments white, with brown anthers. Styles at first white, afterwards turning brown, or dark purple. Fruit quite glabrous and smooth. t. 128. Wight Ic. t. 1005.

Pulneys: in damp or cool places near sholas, flowering May to September. *Fyson* 2067. *Bourne* 24, 414, 956, 1098, 1476.

* * *Nilgiri form*. Stem 12 inches only, basal leaves two or three only, roundish, 1 to $1\frac{1}{2}$ inches diameter, lying flat on the ground. Tothing of these, and upper leaves and fruits as above.

Nilgiris: on the open dry hill-sides springing up and flowering in May after the first rains. *Fyson* 2557, 685. *Bourne* 4756.

These two forms are very unlike in general appearance. One might suspect their differences to be due only to differences of habitat. But while the Nilgiri plant grows in the open, and not I think in the shade; the Pulney plant I have never seen except near sholas, its place in the open being taken by *P. candolleana*.

Pimpinella candolleana *Wight and Arnott*; *F.B.I.* ii 687, XIII 14. Stem usually unbranched, except near the top, from 1 to 2 feet in height, pubescent. Lower leaves sharply and regularly toothed, softly hairy on both sides; veins often reddish below: for the most part stiffly erect though the lowest may be spreading. Bracts of the flowering branches without petioles, but with long clasping bases, palmately three to five-fid; the segments sharply and coarsely toothed, with mucros. Flowering branches divaricating at angles of about 30 degrees: peduncles 1 inch; the compound umbels flat in flower,

rounded in fruit: bracts $\frac{1}{3}$ inch. Filaments white with brown or violet anthers. Styles white, in early fruit spreading and tipped by the violet, stigmas. Fruit papillose. t. 129. Wight Ic. t. 341.

Pulneys: very common in the grass of the open downs, flowers freely May to September. *Fyson* 1027, 2068, 1347, 2761. *Bourne* 1098, 5216. The leaves have a faint smell of Aniseed.

HERACLEUM.

F.B.I. XXXIII.

Cow Parsnip.

Distinguished among our genera by the mericarps being much broader than thick (widest at the division), and when quite ripe often flat and winged by the extra large lateral ridges: by the obscure middle ridges, and solitary vittas which are prominent when dry, three or four only to each mericarp, and usually extend from near the top not quite to the base, being thicker downwards.

Species about 70, mostly in temperate Europe and America. (*Fr.* Berce, *Ger.* Herkuleskraut.)

Many of the species are large plants and since considerable variation occurs and also differences between the upper and lower leaves it is not easy to determine and define the species from dried herbarium material. Considerable confusion has therefore crept in, and I am uncertain about the exact distribution of some of the forms. *H. hookerianum* *W. & A.* appears to be a young form of *H. rigens* *Wall.* *H. candolleana* of Wight's herbarium is not the same as *H. candolleana* of Wight and Arnott's *Prodromus*. *H. pedatum* *Wight* is possibly not of this genus. I differ from C. B. Clarke in the identification of several of the sheets, named by him *H. rigens*, since they appear to me more like *H. sprengelianum*.

Heracleum rigens *Wall. Cat. No. 575!*; *F.B.I.* ii 75 (in part), XXXIII 15; common Cow Parsnip of the Kodai-kanal downs.

Rootstock stout, stem puberulous or pubescent. Leaves of three to five leaflets. Leaflets and their lobes rounded, margin serrate or dentate. Rays of umbel numerous (fifteen to thirty), 2 to 3 inches: pedicel $\frac{1}{2}$ inch. Flowers yellow. Mericarps when fresh half as thick as broad, $\frac{1}{3}$ to $\frac{1}{2}$ inch, broadly elliptic, brownish red or

pink, drying flat : vittas four, slender, extending half to three-fourth down, as regards width occupying the middle half of the fruit. Wight Ic. t. 1009.

On the open downs. Pulneys : fairly common. Nilgiris : Ootacamund to Coonoor. *Fyson* 1831, 2163. *Bourne* 5227, 120, 1050,* 295, 1099, 1099.* A variety with long fruits occurs at slightly lower levels. *Bourne* 1317,* 1558,* 1278.*

Wall. Cat. 575 (type); Wall. Cat. 575 in Herb Hook : "Conium" of Heyne in Herb. Rottler; Herb. Benth. 47575; Wight's Kew Dist. "Pulneys 1836" and 1183 "Courtallum"; Wight's Kew Dist. 1195 "Coonoor 1846" (five sheets); Wight's Kew Dist. 1185 (two sheets) Wight's Kew Dist. 1186 "Jamalay, Aug. 1848"; Wight's Kew Dist. 1186 "Anamalay forest, 1851."

Heracleum hookerianum Wight and Arnott; *Herb. Wight Prop.* "Avalanche"; *F.B.I.* ii 715, XXX 14; *Wight Ic.* t. 1010; appears to me a young form of the above.

Wight's Kew Dist. 1184 "Avalanche" (two sheets); Gardner "Nilgiris"; Foulkes "Ootacamund 1851" Madras Coll. 21; Hooker and Thomson; Hooker and Thomson bottom half (top half = *H. rigens*).

Heracleum ceylanicum Gardner, *Thwaites Enum.* 131 *C.P.* 145; *F.B.I.* ii 716, and *H. rigens* var *candolleana*, ii 716; XXXIII 17. Basal leaves pinnate. Leaflets, oblong, twice or thrice as long as broad; lateral lobes and segments rounded, terminal, acute; pubescent or tomentose, dentate. Rays 2 to 4 inches. Mericarps very large, $\frac{5}{8}$ by $\frac{1}{3}$ inch : vittas occupying one-third of the breadth, convergent below. Umbels very strongly radiate, the largest petals obovate or obcordate, $\frac{1}{6}$ inch.

Pulneys : on the downs. *Fyson* 474, 2984. *Bourne* 25, 1329. (*H. sprengelianum*.)

Previously recorded only from Ceylon : Gardner in *Thwaites C.P.* 145 (type); Thwaites; Walker (three sheets); Walker (three sheets); Walker, "H. rigens of C.B. Clarke"; Gardner (two sheets); Wight's Kew Dist. 1189; G. Thomson. The last three have rather more pointed leaves, but the plant marked by Clarke *H. rigens* Wall. has leaves of both kinds.

Heracleum sprengelianum Wight and Arnott; *Herb. Wight Prop!*; *F.B.I.* ii 716, XXXIII 18; Giant Cow Parsnip.

Stem glabrous (W. & A. "harshly pubescent"). Leaves very large, over one foot. Leaflets cordate, sessile or decurrent, acute, often irregularly lobed at the base, serrate, glabrous or pubescent. Rays very numerous; pedicels slender $\frac{1}{2}$ inch. Mericarps broadly elliptic, $\frac{1}{3}$ by $\frac{1}{4}$ inch: vittas occupying half or more than half of the width, not convergent below. Wight Ic. t. 1008.

Pulneys: on the downs and near sholas. Nilgiris: Coonoor *Herb. Wight Prop.* 1202, 1193, 1182.

* *var ligustifolium* (*Pastinacia ligustifolia* W. & A. *Prod.* ii 372); *F.B.I.* *H. rigens var candolleana in part*; XXXIII 15.* Leaves pinnate or bipinnate, over 15 by 12 inches. Leaflets deeply pinnati-sect or-fid: ultimate segments acute, deeply serrate, narrower than in *H. sprengelianum*. Rays shorter. Fruits narrower.

Nilgiris: Kotagiri (*Wight's Kew Dist.* 1187, 1181).

The larger forms approach *H. rigens*. The smaller leaf-segments remind one of the leaflets of the *Neem*, except that they are not cutaway obliquely at the base.

***Heracleum pedatum* Wight, *Herb. Prop!*; *F.B.I.* ii 716, XXXIII 20.** Stem up to 18 inches, decumbent and rooting at the nodes. Leaves pedately divided into five leaflets, which are sharply serrate or deeply cut; lateral ones 1 by $\frac{1}{2}$ inch, terminal $1\frac{1}{2}$ by $\frac{7}{8}$ inch. Main umbels on slender peduncles; rays few, final umbels $\frac{1}{2}$ inch very radiate, the outermost petal three or four times the inner ones. Two outer sepals linear, long and spreading; inner obsolete. Petals white, triangular-cordate, deeply notched. Mericarps $\frac{1}{8}$ by $\frac{1}{10}$ inch, broadest at the base, nearly as thick as wide, not winged but five-angled, ridges obsolete. Vittas one between each angle and two on the inner side. t. 130.

In sholas forming a dense growth. Pulneys: common, flowering June to September. *Fyson* 982, 2036, * 3045. *Bourne* 540, 957, 2639, 2640.

The fruits are more than those of a *Sium* than of a *Heracleum*. They mature late and cannot be found ripe before September. The foliage reminds one of that of the Wood Sanicle (*Sanicula europæa*).

ARALIACEÆ.

(HEPTAPLEURUM and BRASSAIA.)

Shrubs and trees with digitately compound leaves on stalks with broad sheathing bases. Flowers small, woody, in spikes umbels or heads, which are again in racemes. Calyx more or less enclosing the ovary and surmounted by five or six small teeth. Petals woody, valvate. Stamens as many. Ovary inferior or half inferior: cells five or six with one seed hanging from the top with micropyle facing upwards and outwards. Fruit fleshy or leathery with a few seeds.

Species about 400 mostly tropical.

Many of the family have a peculiar smell when crushed and are poisonous (e.g., Ivy). Species of *ARALIA* and *PANAX* are well-known garden foliage plants, showing under cultivation great variation in the cutting of the leaves. The family is allied to the *UMBELLIFERÆ* and might be considered its tropical representative, but with its peculiar characteristics much less fully developed. In Europe there is only the very common Ivy., *Ger.* Epheu, *Fr.* Lierre.

Flowers in spikes or umbels, racemed . . . HEPTAPLEURUM.

Flowers in heads, racemed BRASSAIA.

HEPTAPLEURUM.

F.B.I. 71 VII.

Large shrubs or trees, sometimes straggling, glabrous and without prickles. Leaves alternate, crowded near the ends of the branches: stalk with broad sheathing base extended up above the insertion (or stipules adnate to it and joined together above as in the *POLYGONACEÆ*): leaflets five to seven, stalked, entire or nearly so. Calyx-teeth obsolete. Petals five to six or more, valvate. Stamens as many. Ovary more or less inferior and surmounted by a honey-secreting disc fully developed or

aborted (male flowers): cells as many as the petals, one-ovuled: style columnar. Fruit subglobose.

Species 60 in tropical Africa, Pacific islands and Australia.

Heptapleurum (?) *rostratum* *Bedd.*, var *micrantha* *C. B. Clarke*; *F.B.I.* ii 729, VII 5.

Main leaf-stalks 12 to 20 inches: stalks of leaflets 2 to $3\frac{1}{2}$ inches; blades 3 to $8\frac{1}{2}$ inches, oblong or ovate elliptic, shortly acuminate, glabrous on both sides but light-coloured below not very coriaceous with crinkled margin. Panicle up to 9 by 8 inches; peduncles 1 inch, pedicels $\frac{1}{4}$ to $\frac{3}{8}$ inch. Flower buds $\frac{1}{10}$ inch.

Pulneys: in sholas on the downs. Occasionally with palm-like habit. *Fyson* 1820, 2140 (?). *Bourne* 555, 2642.*

The description of the inflorescence and flower is taken from specimens in the Kew herbarium.

I am not certain about this species. My sheets which have no flowers, were returned to me by both Calcutta and Kew as *H. wallichianum* *C. B. Clarke*, which however I feel sure they are not. The nearest I can find at Kew is a plant collected by Gardner on the Nilgiris and named by Clarke in manuscript as above. In *F.B.I.* Clarke described the species as "A small branched tree," presumably from observation of a small specimen. Beddome, the founder of the species, described it as a "large tree" (*Manual to the Flora Sylvatica of South India* 11 CXXII), as also did Wight in his note to his *lc.* t. 1013. Both Beddome and Wight give the leaves as very distinctly toothed, a character ignored by Clarke in *F.B.I.* I have seen only two specimens of my plant living; one inside the large shola at Kodaikanal had a tall slender stem and slender vertical branches bearing leaves only at the top; the other had a tall palm-like stem with crown of leaves, very much in the habit of the Palmyra or Toddy palm (*Borassus*).

Heptapleurum racemosum *Bedd.*; *F.B.I.* ii 729, VII 6. A medium sized well branched tree, easily distinguished in the shola by its branches of hanging leaves (really leaflets), and its axillary compound spikes of small white flowers.

Main petiole 8 to 12 inches, leaflets 5 to 10 inches, elliptic, acute or acuminate, with undulate margin; smaller veins not conspicuous when dry. Wight *lc.* t. 1015.

In sholas common. Pulneys: Kodaikanal downs. Nilgiris: Coonoor. *Fyson* 1066, 2047, 2131.* *Bourne* 518, 2481, 2641.

Gen. Dist. Mountains of South India and Ceylon.

BRASSAIA.

F.B.I. 71 IX.

A small genus of two species separated from HEP-TAPLEURUM because the flowers are collected into small heads and each surrounded at the base by four bracteoles.

Brassaia capitata C. B. Clarke ; F.B.I. ii 732, IX 1. A low well branched tree with the palmately compound leaves and general habit of *Heptapleurum racemosum* and the inflorescence of *Heptapleurum rostratum*, except that the flowers are in dense sessile heads of six or seven, not umbels, at the ends of comparatively short stalks standing out along the stout branches of a large terminal panicle.

Lenticels on the branches and leaf-bases very large, up to $\frac{1}{8}$ by $\frac{1}{16}$ inch. Leaf-base sheathing and continued above the insertion for $\frac{1}{2}$ inch as a triangular intra-petiolar stipule, covering the axillary bud. Petiole 7 inches: leaflets seven, their stalks 2 inches; blade 6 by 2 inches, thick and firm, glossy on the upper side, dull and light green on the under; midrib very stout, brown; veins very slender, but distinct on the upper side, both veins and the smaller reticulations distinct on the lower side. Panicles terminal; branches 14 inches, stout, in the axils of triangular acute $\frac{1}{2}$ inch bracts, dark purple in colour, and with scattered stellate hairs. Peduncles of heads similar, $1\frac{1}{4}$ inches, ribbed, standing out almost at right angles from the main branches in the axils of concave bracts $\frac{1}{5}$ inch. Heads $\frac{1}{2}$ to $\frac{3}{4}$ inch wide, of about ten flowers. Buds round $\frac{1}{3}$ inch, sessile in the axil of three concave brown tomentose bracts. Calyx entire, nearly half the bud. Petals six, valvate, hard. Stamens as many, longer, bent abruptly inwards just below the anther; anther opening inwards. Ovary bluntly conical, continuous with the disc at the base, in which are twelve small hollows containing glistening drops of honey; no style; cells six. t. 131.

Nilgiris : Pykara waterfall-road, near the short cut to Glen Morgan estate: flowering May. Kotagiri and Vellyengry hill (*Wight*). Not collected on Pulneys. Previously recorded only by Wight on the Nilgiris. *Fyson* 2696. *Bourne* (Coonoor).

CAPRIFOLIACEÆ.

Trees, shrubs, or stragglers with opposite leaves joined by lines round the stem but no definite stipules: petals five, united at least at the base with a short tube: stamens as many: ovary inferior of two cells each with one pendent ovule: fruit usually a drupe.

Species about 200 mostly in the northern hemisphere. Western Europe has about 10 species. Elder, *Ger.* Flieder, *Fr.* Surean.

VIBURNUM.

F.B.I. 74 III.

Guelder Rose.

Trees and shrubs with opposite simple leaves, and characterised by the terminal rather flat-topped cymose panicles or corymbs of small white or cream-coloured flowers, and the seeds of a flat oval more or less deeply grooved lengthwise so that the cross section is a T-shape.

Species 100 in temperate and sub-tropical regions, chiefly of Asia and North America. In Europe both wild and cultivated, Guelder Rose, Wayfaring tree; *Fr.* Viorne, *Ger.* Schlinge.

- | | | | |
|---|---|--|-------------------|
| a | { | Corolla rotate (tubular portion very short) | |
| | | | V. acuminatum DC. |
| b | { | Corolla tubular with spreading lobes | b |
| | | Leaves entire: bracts not conspicuous. | V. coriaceum. |
| | | Leaves sinuate: foliage light green: bracts linear . . . | V. hebanthum. |
| | | Leaves dentate with crimson stalks . . . | V. erubescens. |

Viburnum acuminatum DC.; *Wall. Cat.* 4651 !; *F.B.I.* iii 5 as *V. punctatum Ham., var acuminata*; III 7 *. A small tree. Leaves elliptic, 3 to 5 inches long and usually less than half as broad, entire, acuminate, with recurved margins, and covered on the underside with small round

rust-coloured scales or glands ; as also the young parts : veins few. Flowers in terminal, very regular, congested corymbs with peduncles 1 to 2 inches, lenticelled : fruiting corymbs more open. Drupe elliptic or oblong $\frac{1}{3}$ by $\frac{1}{5}$ inch : seeds much compressed, obscurely grooved. t. 132. Wight Ic. 1021 Bedd. Fl. Sylv. t. ccxvii.

Nilgiris : Pykara 7,000 feet. Not Ootacamund. Pulneys : at lower levels, not Kodaikanal. Nowhere else. *Bourne* 638, 639, 2615.

Viburnum coriaceum *Blume, var capitellata Wight Herb. Prop.* as *V. capitellata W.&A.!* ; *F.B.I.* iii 6, III 9. A small tree with, usually, much lobed outline.

Twigs lenticelled. Leaves ovate-elliptic acuminate, with almost acute base and waved or shallow-toothed margin, glabrous except for tufts of hairs in the axils of the nerves on the underside. Panicles rounded : peduncles $\frac{3}{4}$ to 1 inch, dividing into threes : cymes umbellate. Flowers nearly sessile, buds glistening : ovary $\frac{1}{16}$ inch : corolla tube $\frac{1}{6}$ inch ; lobes very small. Fruit $\frac{1}{3}$ by $\frac{1}{6}$ inch compressed. Seed in cross-section a flat W-shaped. t. 133. Wight Ic. t. 1022.

On the margins of sholas.

Pulneys : below and about Kodaikanal and above on the downs, common. Nilgiris : at lower levels, Coonoor, etc. *Bourne* 31.

Gen. Dist. South India and Ceylon.

Viburnum hebanthum *Wight and Arnott ; F.B.I.* iii 6, III 10. A small spreading tree with rounded or lobed outline distinguished from *V. coriaceum* by the brighter green of its foliage and the very distinct linear bracteoles.

Branches with smooth grey bark heavily lenticelled. Leaves all erect in dense tufts at the ends of the year's shoots, elliptic or obovate, hardly acuminate, with sinuate or serrate margin, glabrous except for tufts of hairs in the axils of the, rather few, nerves underneath ;

stalk $\frac{1}{4}$ to $\frac{3}{4}$ inch. Corymbs of flowers flat-topped or rounded much as in *V. coriaceum* : its branches green, four-angled, sticky : bracteoles $\frac{1}{5}$ inch, very conspicuous in bud, then withering and at length falling : buds $\frac{1}{8}$ inch green, nearly sessile, densely pubescent. Calyx-teeth obsolete. Corolla tube $\frac{1}{8}$ to $\frac{1}{3}$ by $\frac{1}{30}$ inch, greenish ; lobes very small, erect. Stamens five, exserted, attached to the base of the corolla : anthers dorsifixed. Fruit ellipsoid, $\frac{1}{3}$ by $\frac{1}{6}$ inch, with the stylar point a little to the dorsal side, black but not shining and with a little yellowish powder. Seed one only in the posterior cell, oval, with a sharp groove on the ventral side and two shallow ones on the dorsal, and so in section a shallow W-shape. t. 134.

On the outskirts of shola along with *V. erubescens*. Nilgiris : Ootacamund and below on the downs to Pykara, very common, flowering March, but buds as early as June. *Fyson* 2004, 2451, 2873.

Not elsewhere.

Viburnum erubescens Wall., var *wightiana* Wall. *Pl. As. Rar.* ii 293, *Cat.* 3729 ; *F.B.I.* iii 7, in part III 15 * ; a road-side or hedge-row shrub distinguished by its laxly spreading forked white-barked branches, crimson leaf-stalks and drooping racemes. Bark on the younger branches a light pinky grey colour, smooth and shining, but with obscure lenticels. Leaves one or two pairs only as a rule, their stalks connected across, so that the leaf-scars encircle the branch ; stalks crimson, pubescent with stellate hairs, as also are the nerves of the lower side : blades broadly ovate or obovate, serrate except the broad rounded base, with often a short triangular or cuspidate point ; midrib pinkish, nerves about six on either side. Flowers in open panicles of cymes, curving downwards in bud, 2 inches long, when the flowers fully open with pinkish or pale green branches. Pedicel or calyx-tube, $\frac{1}{16}$ to $\frac{1}{8}$ inch dark green ; calyx of five minute

triangular teeth. Corolla campanulate ; tube $\frac{1}{5}$ inch white ; lobes five $\frac{1}{10}$ inch sulphur or cream-coloured, imbricate. Stamens attached to the mouth and alternating with the lobes. Ovary two-celled, with short style. Ovules 1 inch each cell, pendent from the inner angle, with its raphe turned to one side (lateral) but more or less on the side of the placenta.

Fruit a one-celled drupe, $\frac{1}{5}$ by $\frac{1}{4}$ inch, usually erect, ovoid or obovoid, red, crowned by the thick short style ; section of the stone a flat W. Differs from the type species in the broader leaves the stellate pubescence on their stalks and the drooping panicles. White Ic. t. 1024.

On road-sides and the edges of sholas. Pulneys : about Kodaikanal at 7,500 feet, not common. Nilgiris : in and about Ootacamund, common, flowering during the winter months. *Fyson* 3046. *Bourne* 4602, 4777.

Wallich's species *V. erubescens* was founded on a Nepal plant shown in his figure (Pl.As. Rar. ii. t. 134) and also described as having erect panicles. His Cat. Nos. 459 and 7474 are slenderer plants with not the same laxly drooping habit and narrower leaves. His *V. wightianum* distinguished as a separate species differs, according to his description chiefly in the leaves being broader and stellately pubescent below. I find also the panicles drooping. *Erubescens* is a good name for our plant, its leaf-stalks are so red.

LONICERA.

F.B.I. 74 VI.

Honeysuckle.

Shrubs erect or straggling characterised by the flowers being in close pairs with ovaries almost or quite united.

Leaves opposite, entire : buds scaly. Pairs of flowers with a bract and usually also two bracteoles, peduncled in the leaf-axils (or in terminal heads or clusters). Sepals five, short. Corolla tube slender, often bulged at the base ; lobes five, unequal or nearly equal. Stamens five, inserted on the tube. Ovary of two or three cells : style long and slender with capitate stigma. Fruit a berry of two or three cells, with a few seeds.

Species about 80 in the temperate regions of Europe, Asia and America. Not in the southern hemisphere. In Europe we have the English common and Fly Honeysuckles, *Ger.* Geiss blatt, *Fr.* Chevre feuille.

Straggling plant. Corolla 1 to 2 inches . . . *L. leschenaultii*.

Erect shrub. Corolla $\frac{1}{2}$ inch *L. ligustrina*.

The genus is divided into a number of subgenera and sections according to the habit of the plant, whether erect or straggling, then arrangement of the pairs of flowers, the bracts, the lobes of the corolla and other differences. Of our species *L. lesch.* belongs to the § *nintooa* and *L. lig.* to § *isikra*.

Lonicera leschenaultii Wall., *Cat.* 471 !; *F.B.I.* iii 10, VI 1; common Honeysuckle. A straggling shrub with reddish brown bark on the main stem, and the younger parts, calyx and underside of leaves covered with short white hairs. Leaves broadly ovate to lanceolate, 2 to 3 by $1\frac{1}{2}$ to $2\frac{1}{2}$ inches, dull green above, white below, veins and reticulations impressed on the upper, raised on the lower side. Flowers in pairs, on peduncles of $\frac{1}{8}$ inch, in the axils of the uppermost leaves, often forming terminal, leafy bunches or occasionally the pairs solitary on short axillary branches. Calyx $\frac{1}{16}$ inch, and teeth $\frac{1}{20}$ inch white tomentose. Corolla white, turning cream colour, tube $1\frac{1}{4}$ inches, slender, erect, as also in bud; upper lip 1 by $\frac{1}{8}$ inch, obtuse, curved back in a circle; lower four-lobed, slightly longer and less curved, $\frac{1}{4}$ inch wide at the top, the two lateral lobes wider than the middle ones, fitting inside them, as also one of the middle lobes inside the other, by small backward directed teeth. Filaments of stamens long. Fruits in pairs, globular, the size of a small pea, crowned by the calyx. t. 135. Wight Ill. ii. t. 120 (not 121-B.).

In thickets and straggling over small trees on the edges of sholas. Common. Nilgiris: Ootacamund and below. Pulneys: below Kodaikanal. At level of Shembaganur, etc. *Fyson* 408, 492, 662, 3047.

Gen. Dist. South Indian mountains, Mysore, Coorg.

Lonicera ligustrina Wall., *Cat.* 479 !; *F.B.I.* iii 12, VI 9; False Privet. When not in flower very like Privet, but the young leaves purplish and fringed with white hairs.

Erect untidy shrub with grey bark; branches numerous, ascending, tufted; the youngest from a persistent sheath of decussate bud-scales, pubescent and purplish. Leaves opposite, stalk $\frac{1}{8}$ inch, blade $1\frac{1}{4}$ by $\frac{1}{2}$ inch or thereabouts, ovate, entire; in bud erect and flat; when young purplish with distinctly revolute and ciliate margin; when older spreading and quite smooth. Flowers on the young shoots in opposite pairs, pendent: peduncle of a pair $\frac{1}{3}$ inch, axillary bracteoles $\frac{1}{8}$ inch linear: common, spherical part of calyx-tube $\frac{1}{8}$ inch; free part $\frac{1}{40}$ inch with minute teeth: buds clavate. The two corolla-tubes of a pair divergent, with a very distinct bend $\frac{1}{16}$ inch above the base, then erect and parallel, bulged at the bottom into a small sac outwards in each case; lobes unequal, cream coloured. Styles of the pair bent abruptly inwards so that the stigmas nearly touch, very hairy below. t. 136. Wight Ic. t. 1025, Ill. t. 121. B. 3.

In thickets and round sholas. Nilgiris: near Ootacamund and on the plateau generally. Pulneys: near Kodaikanal. *Fyson* 669, 1889. *Bourne* 423.

Gen. Dist. Khasia, Nepal and Western Ghats.

RUBIACEÆ.

Trees, shrubs or herbs with opposite leaves connected across the branch on each side by one combined stipule (except in the tribe *Stellatæ*) and flowers solitary or in some form of cymose inflorescence, having an inferior ovary of two to five one-seeded or many-seeded cells; calyx-teeth four or five; corolla monopetalous with as many equal lobes; stamens as many; and fruit dry, then a capsule or of cocci, or fleshy, then a drupe or a berry.

A very large family of some 350 genera and 4,000 species, distributed over the warmer parts of the world. Britain has four genera only, members of one small tribe the *Stellate* in which the stipules are not combined and may be divided and are enlarged to equal the leaves, so that at each node there is a whorl of four, six or eight leaves (Madder, Goosegrass, Bedstraw, Woodruff). With the exception of this tribe the family can nearly always be recognised by the four stipules belonging to a pair of opposite leaves being combined into two connecting the leaf-stalks.

The family is divided into a number of tribes arranged in two main series: those with many seeds to each cell of the ovary (fruit a capsule or berry) and those with one seed only to each cell (fruit splitting into cocci or a drupe).

Common cultivated plants are species of *CINCHONA* (brought here from America for the quinine extracted from the bark), Coffee, *IXORA* (common in Madras gardens, with bunches of long slender scarlet corollas) and *MORINDA* (with the ovaries of several flowers coalescing). *MUSSÆNDA*, with one calyx lobe much enlarged like a white or yellow leaf, is common on the ghat road below Kodaikanal and Coonoor.

- | | | |
|-----|--|--------------|
| a { | Leaves six at a node, narrow : stem slender . . . | GALIUM. |
| | Leaves four at a node, heart-shaped, stalked . . . | RUBIA. |
| | Leaves two or three only at a node | b |
| b { | Lower flowers in terminal panicles or cymose corymbs . . . | c |
| | Flowers few in leaf-axils only—shrubs with fetid leaves or fruit | LASIANTHUS. |
| c { | Lobes of corolla valvate in bud | d |
| | Lobes of corolla twisted in bud ; shrubs | g |
| d { | Herbs | e |
| | Shrubs | f |
| e { | Leaves very fetid | ANOTIS. |
| | Leaves not fetid : ovules two only, with cap at upper end. | KNOXIA. |
| f { | Fruit a small capsule, flowers white or tinged with mauve. | HEDYOTIS. |
| | Fruit a flat capsule, broader than long . . . | OPHIORRHIZA. |
| | Fruit a black berry : flowers white . . . | PSYCHOTRIA. |
| | Corolla pink ; tube slender : stigmas ultimately separate. | IXORA. |
| g { | Corolla white ; tube short : stipules and lower bracts tubular | PAVETTA. |
| | Corolla white, stout : stigma long undivided : nerves deeply impressed on upper side of leaves | WEBERA. |

HEDYOTIS.

F.B.I. 75 XX.

(Our species only.)

Shrubs or small woody plants with long bristles on the stipular cup which joins two opposite leaf-stalks; white or pale lilac flowers in terminal panicles; their parts in fours; stamens set in the corolla tube or at the throat, not far exerted; fruit dry, globose, splitting open in two halves, containing many seeds.

Species about 80 chiefly in tropical Asia.

Hedyotis stylosa *Brown*, in *Wall. Cat.* 853!; *F.B.I.* iii 51, XX 8. A shrub with rather loosely growing flexuous branches, very variable in habit. Leaf-stalk $\frac{1}{4}$ inch; blade ovate-lanceolate or elliptic, 1 to 5 inches long according to position and strength of shoot, glabrous or pubescent on the nerves underneath: stipular cup with three or four $\frac{1}{4}$ -inch bristles. Capsule entirely within the calyx-tube, $\frac{1}{8}$ by $\frac{1}{12}$ inch, ellipsoid, splitting in two halves which open along their inside faces: calyx-teeth in fruit $\frac{1}{20}$ inch. t. 137. Wight Ic. t. 1027.

By sholas and in cool places. Pulneys: on the downs and below to Shembaganur, common. Nilgiris: on the downs Ootacamund to Pykara. *Fyson* 321, 661, 694, 1206, 1207, 1838. *Bourne* 207, 568, 804,* 1104, 1104.*

Gen. Dist. South Indian hills.

The place of the capsule is often taken by a fleshy gall the size of a small pea.

Hedyotis articularis *Brown*, in *Wall. Cat.* 854!: *F.B.I.* iii 51, XX 9. A shrub characterised by its very close-set erect narrow sessile leaves and, where the leaves have fallen, the rings of dried bristly stipular sheaths.

Leaves 1 by $\frac{1}{4}$ inch, lanceolate or elliptic lanceolate, rigid, glabrous or nearly so, with reflexed margin, and very broad nerves underneath. Cymes terminal, compact. Capsule $\frac{1}{8}$ inch, egg-shaped: calyx-tube unaltered or

occasionally lengthening to $\frac{1}{4}$ inch. t. 138. Wight Ic. t. 1028.

Nilgiris : on Elk hill near Ootacamund abundant. Pulneys : on the downs in hollows by streams, etc., flowers summer. Nowhere else. *Fyson* 691, 1837, 1860, 1896. *Bourne* 571, 963.

Hedyotis swertioides *Hook. f.* ; *F.B.I.* iii 51, XX 11 ; Ground Lilac ; a small undershrub characterised by its stiff ovate leaves and dense terminal panicles of lilac-coloured flowers.

Height 1 to 2 feet, usually in tufts. Leaves sessile ovate, 1 to 3 inches by half as broad, erect, glabrous, firm. Cymes densely pubescent. Calyx lobes longer than the tube.

Pulneys : on the downs above Kodaikanal, very common, flowers summer. Nowhere else. *Fyson* 1070, 3048. *Bourne* 80, 325, 964.

Hedyotis verticillaris *Wight and Arnott* ; *F.B.I.* iii 56, XX 29. Stem short or none, as thick as the finger, Leaves numerous, close-set, 4 to 6 by 1 to 1 inch, elliptic or lanceolate-oblong ; with three main and several minor parallel nerves. Flowers small in dense bunches in three-chotomous panicles on peduncles of 3 or 4 inches. Wight Ic. t. 1029.

Nilgiris at Pykara by the river side. *Bourne* 2659, 4789.

ANOTIS.

F.B.I. 75 XXII.

(*Our species only.*)

Herbaceous plants with evil-smelling leaves and peltate seeds, otherwise as in *Hedyotis*.

Species about 25, in the tropics of Asia and Australia.

- | | | | |
|---|---|--|--------|
| a | { | Flowers pink. Stems weak usually creeping, in the open | b |
| | | A. leschenaultiana. | |
| b | { | Flowers white, stems erect wood-land and shade-loving plants | b |
| | | Flowers small, nearly sessile on capillary peduncles. | |
| | | A. monosperma. | |
| | { | Flowers $\frac{1}{2}$ inch in close panicles | A. Sp. |

Anotis leschenaultiana *Wight and Arnott; F.B.I. iii 72, XXII 3.* A small herb with ovate hairy leaves and flat bunches of pinkish purple flowers.

Whole plant except the corolla tube hairy. Stems weak and rooting at the nodes: stipular band joining the leaf-stalks bristly. Leaves ovate acute, with four or five pairs of rather broad hairy nerves on each side of the midrib, about $\frac{1}{16}$ inch apart, running very regularly to the margin and without connecting veins. Inflorescence regularly and cymosely trichotomous with minute toothed bracts. Pedicels $\frac{1}{16}$ inch, calyx-tube $\frac{1}{20}$ inch; teeth four, $\frac{1}{16}$ inch. Corolla tube $\frac{1}{4}$ inch, glabrous on the outside, very slightly hairy inside: lobes four spreading flat, $\frac{1}{12}$ by $\frac{1}{8}$ inch, stamens erect, the filaments white and attached to the backs of the small purple introrse anthers. Style slender: stigma bifid: top of ovary round and flat, not grooved. Capsule didymous, with hemispherical raised crown, two-seeded with one to eight seeds in each cell: seeds deeply pitted. t. 139.

Common on the downs.

Gen. Dist. Western Ghats of South India.

var 1 type, *Herb. Wight Prop.* 1398!; leaves 1 inch or more, hairy: panicle 2 to 4 inches across, hairy: stipular bristles long. Stems erect or trailing, often on a bare sloping patch. *Wight Ill. t.* 125 but flowers pink not blue. *Fyson* 3049. *Bourne* 33.

var 2 affinis, *Herb. Wight Prop.* 1297!; plant smaller than *var 1*. Leaves $\frac{1}{2}$ to $\frac{3}{4}$ inch hairy; stipular bristles short; panicle 1 to 2 inches, forms flat patches a foot or more across in short grass; very fetid; stems often red on the upper side. *Wight Ic. t.* 1030. *Bourne* 294, 2904.

var 3 deltoides, *Herb. Wight Prop.* 1298!; leaves $\frac{1}{2}$ to $\frac{3}{4}$ inch, nearly glabrous, as also the cymes.

Anotis *Sp., var Hedyotis stipulata Br., in Wall. Cat.* 6195; *F.B.I. iii* 63. A weak fetid plant, straggling through others in the shade, with terminal bunches of white or pale pink, long-tubed, fragrant flowers.

Stem terete, almost glabrous, with internodes of 2 to 4 inches, green or reddish, but white and swollen under the nodes, and never rooting there. Stipular bristles long, $\frac{1}{2}$ inch. Leaf-stalks $\frac{1}{4}$ inch: blades oblong ovate, up to 2 by $\frac{3}{4}$ inch, covered with short hairs on the upper side and on the nerves underneath: nerves eight to nine pairs, the more basal ones closer together than the distal, all curving forwards and reaching the margin. Panicle with fewer flowers than in *A. leschenaultiana*, not regularly trichotomous, bracts and bracteoles with hairy teeth. Calyx-tube nearly glabrous, $\frac{1}{2}$ inch, the teeth more than twice as long, and half as wide, ciliate. Corolla tube $\frac{1}{3}$ to $\frac{1}{2}$ inch, white or pale pink: lobes four, $\frac{1}{8}$ inch, white; ciliate. Stamens four erect, on short filaments at the mouth of the corolla. Stigma purple parted in the bud before the flower opens. Seed one only in each cell. t. 140.

In sholas among other shade-loving plants. Pulneys: above Kodaikanal, flowering September, at night, fading by 10 a.m.

Quite distinct from *A. leschenaultiana*, though the leaves have a superficial resemblance. It seems nearest to the *Hedyotis stipulata* quoted above, but in its feild leaves is certainly an *Anotis*.

Anotis monosperma Hooker, *Wight's Herb. Prop.* 1295 !; *F.B.I.* iii 75, XXII 17. A very delicate, shade-loving plant with slender stem and thin leaves and pale mauve flowers nearly sessile on the long capillary branches of a loose cymose inflorescence.

Stem and leaves pubescent. Leaf-stalk $\frac{1}{4}$ to 1 inch; blades ovate, 1 to 2 inches by $\frac{5}{8}$ to 1 inch, or occasionally much less, acute or acuminate broadest near the base and then narrowed suddenly and cuspidately to the stalk. Inflorescence axillary; branches capillary and divergent. Flowers nearly sessile in twos and threes, in irregular corymbose cymes, white tinged with pink or mauve. Fruit $\frac{1}{12}$ inch, rather broader than long broadest at the top and crowned by the small calyx-teeth. Capsule

slightly convex and compressed laterally with entire, not bilobed, crown; when nearly ripe almost golden yellow. Seed one or two, coarsely pitted.

In sholas and shady places. Puineys: on the plateau. (Pillar rocks, Glen falls.) *Fyson* 2989. *Bourne* 262, 263, 265, 974.

Wight's type sheet, No. 1295, has leaf-blades one-fourth to three-fourth inch, and appears to be a smaller plant altogether. Possibly the one described here is a shade form of it.

OPHIORRHIZA.

F.B.I. 75 XXV.

Small shrubs with opposite entire leaves and white, pink or greenish tubular flowers arranged along one side only of the branches in terminal forking cymes, and distinguished from all other of our genera by the fruit, which is flat, much wider than long, and opens by a split along the long narrow top. Stipules soon falling.

Species about 50, mostly in tropical Asia.

Ophiorrhiza brunonis *Wight and Arnott*; *F.B.I.* iii 79, XXV 10. Leaves 2 to 3 inches ovate-elliptic, acute or acuminate, narrowed to the slender 1-inch stalk. Terminal cymes of flowers rounded. Corolla tube, $\frac{1}{4}$ inch, with narrow lobes. Capsule $\frac{1}{4}$ inch.

Nilgiris: near Lovedale, flowering September to October. *Fyson* 1352. *Bourne* 5253.

WEBERA.

F.B.I. 75 XLII.

Trees or shrubs with terminal corymbiform cymes of bisexual flowers; corolla lobes twisted in bud; filaments of stamens short and anthers long; style stout, stigma long and thick; fruit a two-celled berry with two or more seeds.

Species about 40, in tropical Asia.

Webera corymbosa *Willd.*; *F.B.I.* iii 102, XLII 1. A shola shrub or small tree, distinguished by its terminal cymose corymbs of white fragrant flowers with

five waxy, spreading petals, slender anthers, and thick style; and remarkable for the hard glossy leaves, furrowed by the deeply impressed main nerves.

Branches nearly round, with smooth reddish brown bark, not lenticelled, slightly swollen at the nodes: stipules forming a complete, short, tube $\frac{1}{8}$ inch long above the insertion of the leaves. Leaf-stalk $\frac{1}{3}$ inch, stout, puberulous; blade about 4 by 2 inches, larger or smaller, elliptic, bluntly acuminate, entire, hard, glabrous, very glossy, deeply furrowed; nerves about ten pairs, impressed on the upper side, raised on the lower often (? always), with perforations at the axils; veins inconspicuous. Corymbs terminal, regularly three-branched; peduncle one inch, branches stout, pedicels $\frac{1}{30}$ inch, calyx-tube $\frac{1}{8}$ inch, campanulate, lobes half as long triangular. Corolla tube not as long as the calyx; petals spreading out flat from just inside it, $\frac{1}{4}$ by $\frac{1}{6}$ inch, ovate, waxy. Anthers slender, $\frac{1}{6}$ inch, nearly sessile in the mouth of the corolla. Style projecting about $\frac{1}{5}$ inch above, thickened upwards and ridged. Ovary two-celled, with two or more ovules in each cell. Fruit a small round berry, $\frac{1}{4}$ inch, surmounted by the very conspicuous calyx-teeth (like a diminutive Guava fruit). Seeds few or many, angular with one side rounded.

In sholas. Nilgiris: Ootacamund to Pykara, flowering May. Pulneys: Shembaganur. *Fyson* 500, 2492. *Bourne* 482, 2665.

Gen. Dist. Western Peninsula and Central Provinces.

KNOXIA.

F.B.I. 75 LXI.

Herbs with ovate or lanceolate many-veined leaves, bristly stipules, terminal corymbs of blue or purple flowers and in each cell of the two-celled ovary a single pendent ovule with its stalk swollen and spread out into

a cap at the top. Calyx-teeth four with one larger. Corolla lobes four, valvate in bud. Stamens four, longer or shorter. Style two-cleft at the stigmas, shorter or longer. Fruit of two one-seeded parts, more or less united, separating or not.

Species about 10 in India, Malaya and Australia.

Leaves about twice as long as broad, ovate-acute . K. mollis.
 Leaves lanceolate-acuminate, three times as long as broad
 (probably occurs only at lower levels) . . . K. corymbosa.
 Leaves lanceolate, six times as long as broad . K. wightiana.

Knoxia mollis *Wight and Arnott*; *F.B.I.* iii 129, LXI 2.
 Stem 1 to 4 feet, four-angled, very or slightly pubescent.
 Leaf-stalks $\frac{1}{8}$ to $\frac{1}{4}$ inch: blade $1\frac{1}{4}$ to $2\frac{1}{2}$ inches by
 $\frac{1}{2}$ to $1\frac{1}{4}$ inches, ovate or elliptic ovate, acute, densely
 pubescent on the upper and nerves of the lower side:
 stipular bristles $\frac{1}{4}$ to $\frac{1}{2}$ inch. Corymbs 2 to 3 inches,
 pubescent. Calyx-tube $\frac{1}{16}$ inch; teeth triangular,
 shorter one often slightly larger. Corolla tube $\frac{1}{4}$ to $\frac{3}{8}$
 inch: lobes $\frac{1}{8}$ inch. Fruit ellipsoid; the two halves
 connate and attached to the central columella. t. 141.

Occurs in two fairly distinct forms—

* by road-sides, 1 to 2 feet, corymbs open.

** in damp soil on the sides of sholas, 3 to 4 feet,
 leaves and flowers larger in every way: corymbs close
 down on the top leaves. t. 141.

Pulneys: on the downs common. Nilgiris. *Fyson* 198,
 1835, 1836, 2134, 3050. *Bourne* 444, 982.

Mrs. Evershed tells me that this plant is the food-plant of
 a velvety black *Chærocarpa* (Hawk-moth) caterpillar. The
 flowers have long or short stamens, cf. under *OXALIS* p. 55.

Knoxia wightiana *Wall.*, *Cat.* 6184!; *F.B.I.* iii 129,
 XXI 4. Rootstock stout and woody. Stems slender,
 four-angled glabrous. Leaves narrow, lanceolate, obtuse
 or oblong, narrowed to the base, 2 to 3 by $\frac{1}{4}$ to $\frac{1}{2}$ inch,
 often folded along the midrib and recurved: stipular

bristles often wanting. Flowering corymbs compact, 1 inch; in fruit open 2 to 4 inches. Fruit ellipsoid or globular, $\frac{1}{8}$ inch.

Nilgiris: on the plateau below Ootacamund. Pulneys: at lower levels. *Fyson* 472, 1219, 1910. *Bourne* 983, 2990.

Gen. Dist. South Indian hills.

IXORA.

F.B.I. 75 LXVI.

Shrubs or small trees characterised chiefly by the very slender corolla tubes; petals twisted, anthers nearly sessile on the corolla mouth, style slender, stigma slender, fruit of two pyrenes each with one peltate seed.

Species about 100, in the tropics of Asia and Africa. One species *I. coccinea* is very common in gardens on the plains of South India.

Ixora notoniana Wallich; *F.B.I.* iii 139, LXVI 5. A small shola tree distinguished among all our trees by the very slender corolla tubes, $\frac{1}{2}$ by $\frac{1}{20}$ inch. The flowers are in hemispherical clusters masses into broadly rounded panicles, 6 inches across, pink and fragrant.

A small shola tree; branches roughened by the scars of the fallen leaves and stipules; bark light coloured. Stipules forming a complete sheath round the axis for $\frac{1}{8}$ inch above each pair of leaves with $\frac{1}{6}$ inch subulate points. Leaf-stalks stout $\frac{1}{2}$ inch; blade 4 to 6 by 2 to $2\frac{1}{2}$ inches, entire, abruptly and shortly acuminate (cuspidate), narrowed at the base, firm, quite glabrous and shiny dark green above; midrib stout, veins ten to fifteen pairs, curving forwards near the margin and connected by a coarse network of much more slender ones. Panicles terminal; branches opposite or in threes, well separated, often like the main axis, pink; the branches again branched near their ends, forming very regular hemispherical cymes $1\frac{1}{2}$ inches wide; the whole panicle 4 to 6 inches wide. Calyx-tube $\frac{1}{30}$ inch, longer than

the ovary; teeth longer. Corolla tube $\frac{1}{2}$ by $\frac{1}{20}$ inch, petals $\frac{1}{8}$ inch, spreading or at length reflexed close against the tube. Anthers linear, $\frac{1}{16}$ inch, attached to the mouth. Style exerted $\frac{1}{10}$ inch, bifid. Fruit nearly round, of two cells, $\frac{1}{3}$ by $\frac{1}{8}$ by $\frac{1}{4}$ inch, crowned by the small remains of the calyx; seeds two, hemispherical, attached by the middle to the axile placenta; endosperm curved round the outer margin of the seed, $\frac{1}{30}$ inch thick in the middle where lies the embryo; cotyledons thin and flat, radicle comparatively long, pointing downwards. **t. 142.** *a.* anther; *b.* bud; *c.* opened flower; *f.* fruit; *s.* seed; *e.* embryo; *f.*₂. two fruits in section.

In sholas. Nilgiris: not perhaps at the highest levels; Pykara, flowers May; Kotagiri. A very pretty tree, when in flower, and fragrant. Pulneys: at lower levels. *Fyson* 1194, 1737. *Bourne* 213, 302. Not elsewhere.

PAVETTA.

F.B.I. 75 LXVII.

Shrubs and small trees with terminal cymose corymbs of flowers. Similar to *IXORA*, but distinguished by large stipular bracts at the base of the lower branches of the inflorescence, stipules more united into a tube, style much longer and protruding from the corolla, and ovules on large placentas.

Species about 60 in the tropics of the Old World. One species *P. indica* is common on the plains, about Madras.

***Pavetta breviflora* DC.**; *F.B.I.* iii 151, LXVII 5. A shola shrub, distinguished from all others of this order, by the long, thickened, undivided style projecting $\frac{1}{2}$ inch beyond the corolla, by the rather long buds white with green tips, and by the broad stipules at the lower branches of the cymose corymbs.

Branches smooth, shining, light yellowish grey, conspicuously marked at the nodes by the scars of the stipules. Leaves elliptic, bluntly acuminate, narrowed to the short petiole, 3 to 5 by $1\frac{1}{4}$ to $1\frac{1}{2}$ inches, quite glabrous,

entire, shiny above : nerves about six pairs, very distinctly raised on the underside, hardly impressed on the upper.

Flowers in corymbs of perfect cymes, terminating short branches in the upper axils ; branches stout, the lower sheathed by $\frac{1}{4}$ inch broad, thin, stipules : pedicels slender $\frac{1}{6}$ to $\frac{1}{4}$ inch. Calyx $\frac{1}{20}$ inch, with minute triangular teeth, dark green, glabrous. Corolla tube $\frac{1}{2}$ to $\frac{3}{4}$ inch, white : lobes $\frac{1}{4}$ inch reflexed, in bud green on the outside, twisted. Anthers very slender, $\frac{1}{6}$ inch long, attached by short slender filaments to the top of the corolla tube. Style twice as long as the corolla tube, thickened at the end and greenish, undivided, persistent after the fall of the corolla. Ovary two-celled, with one ovule in each cell. Fruit black, $\frac{2}{5}$ inch across, containing one or two stones. Wight Ic. t. 1035.

Under the shade of shola trees, as an undershrub : on both plateaus flowering summer, fruiting winter months. *Fyson* 1887, 2660. *Bourne* 988.

PSYCHOTRIA.

F.B.I. 75 LXXV.

Shrubs or small trees with flowers in terminal clusters, and characterised by the short straight corolla tube, petals valvate in bud, ovary of two cells each with one wedge-shaped ovule erect from the base, and fruit a drupe containing two plano-convex pyrenes each with one plano-convex thin-coated seed with hard endosperm and small basal embryo. Another characteristic is the presence of glandular hairs in the axils of the stipules.

! A large genus of 500 species all tropical or sub-tropical.

Psychotria congesta *Wight and Arnott* ; *F.B.I.* iii 162, LXXV 5. All parts glabrous. Leaves 2 to 5 inches by a third as broad obovate or oblanceolate, broadest well beyond the middle, bluntly cuspidate or acute, and narrowing gradually to the $\frac{1}{4}$ to 1 inch stalk : nerves eight to the pairs, very regular and strong. Cymes dense

with short thick branches. Corolla tube very short. Fruit ellipsoid or roundish, black, crowned by the persistent, $1/16$ inch, calyx-tube (like the English Black Currant). Seeds two or one only, each in its own parchment (like Coffee), plano-convex and wedge-shaped, not grooved on the inner side: endosperm hard, ruminant: radicle pointing downwards.

Very common as a shrub in woods: foliage usually very dark. Nilgiris: Ootacamund to Coonoor. Pulneys: Kodaikanal and below. *Fyson* 692, 1081, 1193, 1863, 1892, 1902, 2600. *Bourne* 244, 990, 2678.

Gen. Dist. South Indian hills.

* *var astephana* with less crowded cymes and scarcely raised calyx limb to the fruit. Pulneys.

Psychotria bisulcata *Wight and Arnott; Herb. Wight* 1351!; *F.B.I.* iii 171, LXXV 36. Leaves elliptic or obovate, broadest near the middle, and the two ends nearly equal: nerves about nine pairs. Pyrenes a shallow T-shape. A dark leaved shrub growing, like *P. congesta*, in the shade of large trees.

Nilgiris: Kotagiri very common. *Fyson* 1743.

Gen. Dist. Doubtfully in Ceylon.

LASIANTHUS. F.B.I. 75 LXXIX.

Shrubs with small flowers nearly sessile in the leaf-axils and characterised most prominently by the evil smell of the leaves or fruit. In some species the spreading branches with leaves all facing upwards remind one of the Coffee.

Branches compressed at the nodes. Leaves mostly facing all upwards: nerves starting mostly from below the centre of the midrib and curving forward to meet or die out in the margin near the apex; joined by innumerable and close-set horizontal simple or forked veins. Flowers small, in axillary clusters or cymes peduncled

or not. Calyx short with four or five teeth. Corolla funnel-shaped, $\frac{1}{2}$ inch or less: lobes valvate in bud, white, pubescent on the upper and inner side (whence the name from the Greek LASIOS soft and ANTHOS flower). Stamens on the corolla throat: anthers linear or oblong. Ovary of four to nine cells, with one erect ovule in each. Fruit a small drupe seeds narrow.

Species about 80, nearly all in the tropics of Asia.

Stem usually simple with slender horizontal branches; leaves three or four times as long as broad, all facing upwards . . .
L. coffeoides.

Well branched shrub: leaves facing all directions, twice as long as broad, rounded at the base, shortly acuminate . . .
L. venulosus.

Leaves wedge-shaped at base, with long acumen and three or four pairs only of nerves L. acuminatus.

Lasianthus acuminatus *Wight pro parte; F.B.I. iii 185, LXXIX 27.* Characterised by the leaves wedge-shaped at the base and drawn out into an acumen at the tip with three to four pairs only of strong nerves.

Branches slender, sparingly pubescent or glabrous. Petioles $\frac{1}{5}$ inch pubescent or glabrous. Blades $3\frac{1}{2}$ to 4 by $1\frac{1}{4}$ to $1\frac{1}{2}$ inches, obovate or oblanceolate acuminate narrowed to the petiole, glabrous above and below except on the nerves. Nerves three to four pairs seldom starting from the midrib beyond the broadest part of the leaf, strongly raised below when dry. Flowers subsessile, pedicel $\frac{1}{16}$ inch. Calyx-tube $\frac{1}{12}$ inch, teeth half as long. Corolla woolly within. Stamens $\frac{1}{4}$ inch.

'Pulneys near Kodaikanal. *Fyson 1079.** Bourne 1271, 2007. Wight Kew Dist. 1399, stock "33 Nephitodes."*

This is I believe what Wight had most in his mind in writing the description of the species in the *Calcutta Journal of Natural History* vi. (1846) p. 511. On his type sheet at Kew there are two species, the other being my *L. coffeoides*.

Lasianthus venulosus *Wight, Herb. Prop!; F.B.I. iii 100, LXXIX 49.* A shrub, common under the shade of

trees, with branches sloping upwards very regularly at about 45° ; yellowish white flowers in nearly sessile cymes of three; and black fruits $\frac{1}{2}$ inch across—not at all foetid except the last. Branches when as thick as the finger still smooth and green, marked by the irregular warty ring-scars of the stipules; these only on the youngest parts, barely $\frac{1}{10}$ inch. Petioles $\frac{1}{5}$ inch, channelled above. Blade oblong-oval rounded at the base, or broadly ovate, acute or with a short apex, quite glabrous on both sides, spreading or stiffly erect; nerves about six on each side, strong below and above, curving forwards to meet at the apex, and joined by reticulate more or less horizontal veins. Petals yellowish-white recurved, very pubescent on the inner side. Young fruit green, four-angled with the calyx-teeth persistent round a $\frac{1}{8}$ -inch circular scar at the top; when ripe black, shining, with four angular stones. t. 143. Wight Ic. 1032.

In sholas as part of the second grade of woody plants.

Nilgiris: in and near Ootacamund and all over the downs to Pykara. Pulneys: about Kodaikanal. *Fyson* 1447, 1745, 2440, 2467, * * 2510, 2551, 3052. *Bourne* 246, 273, 421, 557, 1364, 2680, 4606.

Gen. Dist. Apparently only on these hills.

***Lasianthus coffeoides* *Fyson*; LXXIX 50; Bastard Coffee.** A shrub with upright undivided stem, long horizontal branches and evil-smelling leaves all facing upwards—much in the habit of the cultivated coffee.

Stem single, erect. Branches slender, weak, adpressed, pubescent. Stipules triangular, $\frac{1}{6}$ inch. Leaf-stalks $\frac{1}{4}$ inch, pubescent; blades bifarious, ovate elliptic acute, 4 to 5 by $1\frac{1}{2}$ inches, glabrous and shining above, pubescent on the nerves below; nerves six to nine on each side, the last arising on the midrib well beyond the middle. Flowers three to four together, sessile on the $\frac{1}{8}$ -inch peduncle; bracts linear $\frac{1}{12}$ inch. Receptacle, calyx-tube

and teeth each about $\frac{1}{16}$ inch. Corolla tube $\frac{1}{5}$ inch; lobes $\frac{1}{6}$ inch, oblong hairy within. Anthers almost sessile on the throat. Style slender; stigmas four, spreading, $\frac{1}{50}$ inch each.

The coffee-like habit gives this, among our plants, a very characteristic appearance.

Pulneys: in the sholas near Kodaikanal and on the downs. *Fyson* 1821, 1235, 1088.

A piece of this plant is one of Wight's type sheets of *L. acuminatus*.

GALIUM AND RUBIA.

Slender stemmed herbs, distinguished from all other of our plants by the stipules not being united in pairs but enlarged like leaves, and in some species even divided, so that at each node there are from four to eight 'leaves.' Corolla lobes valvate in bud. Fruit of two small coriaceous or fleshy indehiscent lobes.

Corolla lobes five, leaves heart-shaped stalked . . . RUBIA.

Corolla lobes four, leaves narrow GALIUM.

RUBIA. F.B.I. 75 LXXXIX.

Madder.

A genus allied to *Galium* (Goose-grass, Bed-straw, etc.), but with the petals five instead of four.

Species 5, Europe, Asia, Africa and South America (*Fr.* Garance, *Ger.* Rüte).

Rubia cordifolia *Linn.*; *F.B.I.* iii 202, LXXXIX 1. Stems slender, four-angled, rough, weak and straggling or climbing up shrubs and small trees. Leaves four in a whorl, with unequal petioles varying from $\frac{1}{4}$ to 2 inches: blades cordate, usually 1 to 2 by $\frac{5}{8}$ to 1 inch, but sometimes quite small and often only one and a half times as long as broad, shining above, very scabrid; nerves three to seven carving from base to apex or the margin near it, very strong. Cymes in small conicles axillary to leaf-like bracts on short axillary branches. Receptacle ovoid

entire. No sepals. Corolla rotate, five-lobed. Fruit $\frac{1}{8}$ to $\frac{1}{6}$ inch, globose or two-lobed. t. 144.

In thickets or climbing up small trees. Common on both plateaus. *Fyson* 294, 462, 653. *Bourne* 4.

Gen. Dist. In temperate climates of India, tropical Africa and Asia, and Japan.

GALIUM.

F.B.I. 75 XC.

Bed-straw, Goose-grass, etc.

Distinguished from RUBIA by the petals being always four not five.

Species over 200. In Europe several. (*Ger.* Klebekraut, Bettstroh; *Fr.* Gratteron, Caille-lait.)

Leaves four, broad. Fruit with hooked spines

G. rotundifolium.

Leaves six or eight, narrow. Fruit smooth . *G. asperifolium.*

Galium rotundifolium *Linn.*; *F.B.I.* iii 204, XC 1. Perennial, glabrous or pubescent, stems weak, trailing. Leaves $\frac{1}{5}$ to $\frac{1}{3}$ inch broadly ovate, mucronate, three-nerved. Flower bunches at the ends of short branches. Fruit with hooked spines.

Nilgiris: on the downs near Ootacamund. Pulneys: below Kodaikanal. *Bourne* 541, 9996, 4617.

Galium asperifolium *Wallich*; *F.B.I.* included in *Galium mollugo* *Linn.*, iii 207, XC 12; * Indian Bed-straw. Stem slender, slightly rough on the four angles. Leaves at a node six, obovate apiculate, one-nerved, with a few scattered hairs. Flowering branches copiously branched, their leaves smaller and at the final divisions $\frac{1}{6}$ or $\frac{1}{8}$ inch only and reduced to two or three only at the node. Flowers minute, petals $\frac{1}{16}$ inch ovate. Fruit nearly glabrous. Climbing on bushes and shrubs.

Pulneys: on the downs above Kodaikanal. Nilgiris: on the plateau (?) Ootacamund. *Fyson* 494, 665, 1284, 2082, 3055. *Bourne* 36.

Gen. Dist. Mountains of India, Himalayas, etc.

VALERIANACEÆ.

VALERIANA.

F.B.I. 76 III.

Valerian.

Herbs with simple or sparingly branched stem; opposite, pinnate or occasionally simple, leaves; and numerous small pink or white flowers in much branched terminal, corymbose panicles. Ovary inferior with no calyx-teeth; corolla tube slender, usually swollen on one side near the base, five-lobed; stamens three only; ovary inferior, three-celled, ripening into a one-seeded dry fruit crowned by a pappus of a few feathery hairs.

Species about 150, in moist temperate or cool regions; mostly in Europe, America and Asia; a few in Africa; but none in Australia or New Zealand (*Ger. Baldrian*).

Leaves simple or with one or two leaflets below the main blade *V. leschenaultii*.

Leaves pinnate, leaflets five, broad *V. hardwickii*.

Leaves pinnate, leaflets seven, end leaflet broad, lateral narrow; fruit hairy *V. hookeriana*.

Leaves pinnate, leaflets many, all narrow: fruit glabrous *V. beddomei*.

Valeriana hardwickii Wall., Cat. 433 !; *F.B.I.* iii 213, III 9; Five-leaf Valerian.

Main roots 3 to 6 inches large, and $\frac{1}{6}$ inch thick, white, all from the stem-base, undivided. Stem herbaceous, $1\frac{1}{2}$ to 3 feet, pubescent at the nodes, only slightly so elsewhere. Radical leaves disappearing before flowering time: of stem leaves the leaflets usually five, occasionally more, ovate; the terminal largest and not much longer than broad, the lateral slightly narrower but not much so. Corymbs in early flower 1 to 3 inches across; but in fruit much larger and more open, becoming a panicle a foot high and wide, the branches repeatedly forking. Fruit $\frac{1}{8}$ by $\frac{1}{16}$ inch cylindrical ovoid, hairy. Wight *lc. tt.* 1045-6.

In woods. Nilgiris : Lovedale, Coonoor. Pulneys : on the edge of the plateau, not common. Flowers June to September. *Fyson* 2104, 1501. *Bourne* 511, 996, ** 999.

Gen. Dist. Mountains of India, Himalayas from Kashmir to Khasia, South India, Java (*V. javanica* Bl.).

Some Nilgiri plants have pubescent leaves and occasionally more leaflets, but I am unable to distinguish them as a variety (cp. *F.B.I.*), for in other respects they appear to be exactly Wallich's type.

***Valeriana hookeriana* Wight and Arnott ; *F.B.I.* iii 214, III 11.** Stem pubescent, bearded at the nodes. All lower leaves pinnate, lowest long-stalked : leaflets seven or more ; end leaflet ovate or obovate, sinuate or coarsely and bluntly toothed, $\frac{1}{2}$ to 2 inches ; lateral leaflets lanceolate, $\frac{1}{2}$ to 1 inch, of the lowest leaves toothed, of the upper entire and narrower (oblong to linear). Corymbs in fruit lax, 3 to 4 inches across. Fruit ridged and hairy. *b.* ovary. *t.* 145. Wight III. *t.* 129.

Pulneys : on the downs, flowers March to July, very abundant. Not elsewhere. *Fyson* 347, 1831. *Bourne* 78, 787, 997.

Very close to *V. moonii* Arn., of Ceylon, which however has fewer and much larger leaflets. I have only two plants, both with distinctly more hairy stem and narrower leaflets than Wight's Pulney specimens approaching in the latter respect *V. beddomei*, which may be a glabrous form of this species.

***Valeriana leschenaultii* DC., var *brunoniana* ; *F.B.I.* iii 214, III 12.** Stem glabrous or nearly so. Leaves simple or with perhaps one or two degenerate leaflets or lobes at the base of the blade or on the 2 to 6 inches leaf-stalk : blade lanceolate, to ovate or cordate, or in the upper parts oblanceolate, entire or nearly so. Fruit glabrous. *t.* 146. Wight Ic. 1043.

Nilgiris : on the downs, Ootacamund to Pykara and Coonoor ; flowers June to September only here. *Fyson* 667. *Bourne* 2684, 4604, 5200. I am told that in some situations the leaves are large, "like an Arum" and fleshy.

***Valeriana beddomei* C. B. Clarke ; *F.B.I.* ii 214, III 13.** Lowest leaves pinnate. Leaflets numerous oblong,

terminal one not much larger. Fruit glabrous, in fairly compact not very loose corymbs.

Pulneys : on road to Poombari. *Bourne* 997,* 998, 2685.

DIPSACACEÆ.

Teasel and Scabious.

Herbs with opposite leaves, and flowers with inferior ovaries small and usually aggregated into heads with bracts below much as in COMPOSITÆ ; but the stamens free of each other (never united by their anthers) and the ovule or seed hanging from the top of the ovary not erect and inverted.

Species about 120 chiefly in the Mediterranean region, western Asia, South Africa, Japan and Ceylon. None in America, Polynesia or Australia.

In western Europe are two genera—DIPSACUS, Teasel, *Ger.* Kardendistel, *Fr.* Cardere ; and SCABIOSA, Devils Bit, etc., *Ger.* Storbuse, *Fr.* Scabieuse.

DIPSACUS.

F.B.I. 77 III.

Teasel.

Flowers in dense, stalked heads opening along a ring half way between centre and circumference (in COMPOSITÆ always from the circumference inwards) : bracts between the flowers well developed : calyx-limb or top of ovary hairy but not bristly (distinction from SCABIOSA) ; ovary four-angled : corolla four-lobed, blue purple white or yellow : stamens four. All European and most Asiatic species with prickly stems and spiny involucre bracts, some Indian species (as ours) not so.

Species 86 in Europe, Asia, and Africa, especially round the Mediterranean.

***Dipsacus leschenaultii* Coult. ; F.B.I. iii 215, III 5.**
A large herb with stout rootstock. Stem annual, 4 feet or higher, hollow, white or greenish leafy from the base

but not near the flowers. Leaves opposite, clasping the stem and the upper ones meeting round it to form cups : lower pinnate or deeply pinnatifid, the terminal leaflet much the largest and decurrent as also most of the others ; lateral leaflets or segments obliquely obovate or oblong ; lowest distant ; all coarsely toothed ciliate, hirsute or almost glabrous underneath except on the nerves ; thinly pubescent above : lowest leaves very large, to 2 feet long ; upper leaves smaller but otherwise similar. Flower-heads 2 by 1¼ inches long, peduncled, in loose cymes from the axils of linear bracts. Involucral bracts ovate-lanceolate, hairy : floral bracts strongly mucronate and covered with hairs from tubercled bases. Flowers white or yellowish ; corolla tube shaggy at the base with reflexed hairs ; lobes oblong, the two lower larger. Stamens four, well exserted ; filaments white, anthers purple. Style short at first, then exserted, flattened at the stigma. Fruiting head almost spherical, bristling with the long points of the stiff floral bracts : the involucral bracts depressed. t. 147. Wight Ill. ii. t. 130.

On the open downs above Kodaikanal. Flowers from June to September. Nilgiris. Not elsewhere. *Fyson* 3045. *Bourne* 245.

The absence of prickles makes this plant, at first sight, appear much more like the English Scabious than Teasel.

COMPOSITÆ.

In this family the flowers are individually small, but massed into, usually flat, heads. The head is surrounded and enclosed in bud by an *involucre* or covering of *bracts*, which when the head is open forms a cylindrical tube or hemispherical cup surrounding the flowers at least at their base. The shape and character of these *involucral bracts* are of some importance (every head of a plant

and of a species is of course the same). They may be in several rows and overlap each other, or be only a few in one circle with perhaps a few shorter outside (SENECIO Ragwort, TARAXACUM Dandelion). They may be long and narrow, or short and broad, acute or obtuse; they may be altogether green, or have a papery margin at the end (CHRYSANthemum, ARTEMESIA Wormwood), or be altogether papery and glistening (ANAPHALIS, GNAPHALIUM Everlastings) or be spiny (CNICUS Thistle). The individual flowers being not quite complete are usually termed *florets*, and the more or less flat expansion of the stalk on which they are set, and which is backed and edged by the involucre, is termed the *receptacle*. In Sunflower and its allies and in some others there are scales on the receptacle between the florets. The ovary is inferior, the corolla being above it, and there are no sepals, though often hairs or scales develop in their place (*pappus*). The corolla is monopetalous and is either *tubular*, slightly enlarged above the middle and ending in five (or four) small lobes; or extended to one side in the form of a strap or a tongue, and hence called *ligulate*. At the end of the flat tongue-shaped part there are usually three or five teeth, and there may be in addition a tooth at the bottom end where it joins the basal tubular portion. The nature and arrangement of the florets in the head are of very great importance.

In some the florets are all tubular and similar (VERNONIA, EUPATORIUM Hemp Agrimony, CNICUS Thistle); in some though all are tubular the outer have no stamen (DICHROCEPHALA); in others most are tubular but there is a circle at the outside of ligulate ones called *rays* (ASTER, HELIANTHUS Sunflower, SENECIO Ragwort); in others again all the florets are ligulate (TARAXACUM Dandelion, CREPIS Hawksbeard,

SONCHUS Sow Thistle). There are five stamens with separate filaments attached to the corolla tube, and rather long narrow anthers connected to each other by the edges and forming a brown cylindrical box round the style. In all cases, except ADENOSTEMMA, each anther has at the top a small triangular flap, and these together close the top of the box and so protect the pollen which is shed inside out of the anthers; but in some genera the bases of the anther lobes are *rounded*, in others produced downwards in slender *tails*. This last distinction is of considerable importance: it is used for instance to distinguish the VERNONIA tribe from the EUPATORIUM tribe. The ovary has a single chamber with one ovule and a single style divided at the top into two stigmatic branches. These branches open out only after the style has pushed its way upwards between the anthers (pushing up pollen as it does so): and since all the florets do not come to maturity together, but the outermost first and the most central last, one can usually find styles in all stages in one head. The stigmatic branches vary considerably in shape, being long and pointed (*subulate*) or flattened on one side or thick and cut off square (*truncate*) or they end in a conical thickening. The fruit is dry and indehiscent, and termed an *achene*. In some cases it has a tuft or circle of hairs (*pappus*) or scales at the top, but in others it is quite without them (Chrysanthemum, Sunflower). It contains one seed with oily endosperm.

The family is a very large one of about 10,000 species or one-tenth of the whole phanerogamic Flora of the world and found in all regions and especially on mountains. The method of cross-pollination is very good (see below); and where there is a pappus to the fruit which allows it to be carried great distances by wind, a species is able to spread rapidly on new ground. Curiously enough, however, we find as a matter of fact that most of the species are very local.

The *tribes* or sections of the family represented here are—

A. Florets all tubular and similar.

(i) Florets blue mauve or white never yellow: involucre bracts green.

I. **VERNONIÆ.** Anthers cleft at the base (cells tailed): stylar arms subulate: leaves usually alternate.

Pappus short: involucre bracts broad, leaf-like
CENTRATHERUM.

Pappus long: involucre bracts narrow, leaf-like VERNONIA.

II. **EUPATORIÆ.** Anther cells not tailed: stylar arms obtuse pappillate. Leaves opposite or alternate.

Pappus of scales AGERATUM.

Pappus; anthers with short tips: sticky herb ADENOSTEMMA.

Pappus of slender hairs EUPATORIUM.

English example: EUPATORIUM Hemp-Agrimony.

(ii) Florets sometimes yellow: involucre bracts often spiny.

IX. **CYNAROIDEÆ.** Anther cells tailed: stylar arms short: involucre bracts scarious or spiny: leaves alternate, often spiny.

Achenes glabrous, with horizontal base: pappus hairs feathery.
CNICUS.

English examples are CARDUUS, CNICUS, CAROLINA, AND OROPONDON Thistles; CENTAUREA; Knapweed, Bluebottle; ARCTIUM Burdock; SERRATULA; SAUSASUREA.

B. Outer florets without stamens: often but not always ligulate.

(i) Involucre bracts in several rows.

(a) Receptacle naked.

III. **ASTEROIDEÆ.** Stylar arms flattened and ending in a conical thickening: anthers not tailed: disc florets yellow. Rays usually yellow, but also white or purple.

* Heads not rayed, outer florets slender.

Heads spherical, purplish: receptacle tall with flat top: no pappus DICHROCEPHALA.

Heads cylindrical, golden; receptacle flat: pappus long CONYZA.

** Heads rayed.

No pappus: achenes viscid MYRIACTIS.

Pappus copious ERIGERON.

English examples: ASTER; ERIGERON Fleabane.

VI. ANTHEMOIDEÆ. Involucral bracts scarious or with scarious tips : anther cells not tailed : stylar arms truncate : receptacle naked (or occasionally with scales).

Heads small roundish, numerous, not rayed . . . ARTEMESIA.

English examples : TANACETUM Tansy ; ARTEMESIA Wormwood ; CHRYSANTHEMUM ; MATRICARIA and ANTHEMIS Chamomile ; ACHILLEA Yarrow.

IV. INULOIDEÆ. Anther cells sagittate (tailed or not) : stylar arms linear, or of sterile florets not separating : pappus copious (all florets in our genera tubular, outer very slender).

* Bracts green, narrow.

Anther cells tailed BLUMEA.

Anther cells not tailed : stem winged LAGGERA.

** Bracts scarious.

Central florets with stamen and undivided style (sterile) : bracts white or pink. ANAPHALIS.

All or nearly all florets fertile (styles divided) : bracts yellow. . .
HELICHRYSUM.

English examples : GNAPHALIUM, ANTENNARIA (Cudweed) Everlasting ; FILAGO ; INULA Elecampane ; PULICARIA Fleabane.
Madras example : VICOA.

(β) Receptacle with scales between the florets.

V. HELIANTHOIDEÆ. Heads rayed : anther cells not tailed : stylar arms truncate : achenes naked or with scales (but no pappus) : receptacle with scales between the florets : leaves in our genera opposite.

* Disc florets sterile with undivided styles . . . CHRYSOGONUM.

** All florets fertile.

Five outer involucral bracts long, sticky . . . SEIGESBECKIA.

Heads flat : rays conspicuous yellow : achenes with two to four barbed bristles BIDENS.

English examples : HELIANTHUS Sunflower ; BIDENS Bur-marigold.

(ii) Involucral bracts in one row all same length or a few outer shorter.

VII. SENECTIONIDÆ. Involucral bracts in one row all the same length or a few shorter outside : pappus of fine hairs : anther cells obtuse or with short points, not tailed : rays usually yellow : leaves alternate.

* Heads not rayed.

Bracts all one length : florets all purple **EMILIA.**

A row outside of shorter bracts :—

Stylar branches long and hairy **GYNURA.**

Stylar branches ovate at tips : fleshy herbs . . . **NOTONIA.**

* * Head rayed or not, stylar branches truncate . **SENECIO.**

English examples : **TUSSILAGO** Coltsfoot ; **DORONICUM.**
Leopardsbane : **SENECIO** Ragwort, Groundsel.

C. All florets ligulate.

XI. CICHORIACEÆ. All florets ligulate with five-toothed tip : anther bases sagittate but not tailed : stylar arms slender : leaves never opposite. Usually milky herbs.

* Stems leafy : achenes contracted at both ends.

Hispid herbs : pappus hairs feathery or some achenes without pappus **PICRIS.**

Smooth herbs : pappus copious simple, silvery, soft . **CREPIS.**

* * No stem. Leaves all radical, heads solitary on a scape : achenes with long beak bearing simple pappus hairs . .

TARAXACUM.

English examples : **CICHORIUM** Chicory ; **CAPSANA** Nipplewort ; **PICRIS** and **CREPIS** Hawksbeard ; **HIERACIUM** Hawkweed ; **TARAXACUM** Dandelion ; **LACTUCA** Lettuce ; **SONCHUS** Sow-thistle ; **TRAGAPOGON** Goatsbeard ; **HELMINTHIA** Oxtongue.

* Branched leafy herbs with heads in open corymbs : inner bracts of involucre thickened : achenes narrowed at each end.

Pappus hairs simple **PICRIS.**

Pappus hairs feathery **CREPIS.**

* * Branched herbs : involucre dilated at the base : achenes narrowed below and above.

Achenes compressed, beaked **LACTUCA.**

Achenes not beaked **SONCHUS.**

* * * Heads solitary on leafless stems.

Pappus hairs simple **TARAXACUM.**

Pappus hairs feathery **HYPOCHÆRIS.**

KEY TO THE GENERA.

- a { Florets all tubular : heads not rayed b
 { Inner florets tubular; outer strap-shaped forming rays
 (Sunflower, etc.) m
 { All florets strap-shaped (Dandelion, etc.) s

Florets all tubular.

- b { Florets purple, blue or white, never yellow c
 { Florets yellow f
 { Outer involucre bracts very broad, almost leafy : underside
 of leaves white between green veins
p. 213. CENTRATHERUM.
 c { Involucre bracts narrow, in one or more series d
 { Heads almost spherical, the receptacle tall and flat-topped :
 outer florets slender : white, no pappus
p. 220. DICHROCEPHALA.
 d { Anthers cleft at the base (tailed) : leaves alternate h
 { Anthers not cleft : leaves opposite (*Eupatoriæ*) e

Eupatoriæ.

- e { Flowers mauve : achenes with five scales. *p. 219. AGERATUM.*
 { Flowers white : achenes with scabrid hairs : young parts
 sticky *p. 219. EUPATORIUM.*
 { Sticky herb : anthers without the usual flap at the top :
 achenes five-ribbed, sticky : pappus of three to five short
 stiff hairs *p. 218. ADENOSTEMMA.*
 f { Heads globular $\frac{1}{6}$ to $\frac{1}{4}$ inch; outer florets slender :
 no pappus *p. 220. DICHROCEPHALA.*
 { Heads cylindrical, receptacle flat : achenes with pappus. g
 g { Involucre green i
 { Involucre glistening, yellow, white or pink
pp. 227, 234,
227. ANAPHALIS, GNAPHALIUM OR HELICHRYSUM.
 { Leaves entire or toothed, bracts in several rows
p. 214. VERNONIA.
 h { Leaves pinnatifid, lyrate, or stem clasping : heads broadest
 at the base, bracts in one series only *p. 240. EMILIA.*
 { Leaves irregularly toothed : woolly or strongly scented
 herbs *p. 224. BLUMEA.*
 i { Outer involucre bracts leafy : achenes sticky : heads $\frac{1}{2}$ inch.
p. 234. CARPESIMUM.
 { Outer involucre bracts acute and spreading : stem winged
 but not spiny *p. 226. LAGGERA.*
 { Whole plant spiny, pappus feathery *p. 246. CNICUS.*

- | | | | |
|---|---|---|----------------------------|
| u | { | Heads in racemes; beak of achene ending in a small disc bearing the simple pappus hairs . . . | <i>p.</i> 251, LACTUCA. |
| | | Heads solitary on scapes | <i>v</i> |
| v | { | Scape thick hollow; never branched; outer bracts pendulous | <i>p.</i> 250, TARAXACUM. |
| | | Scape slender; inner achenes not beaked, | <i>p.</i> 250, HYPOCHÆRIS. |

CENTRATHERUM.

F.B.I. 78 1.

Herbs with alternate stalked toothed leaves, all the florets of a head tubular and similar, purple or white: ribbed achenes, and short scabrid, quickly falling pappus (distinction from *VERNONIA*).

Species about 10 mostly India, Malaya and a few also in America and Australia.

Centratherum reticulatum *Benth. ; Wight Herb. Prop.*
139I!; *F.B.I.* iii 227, II 1. Distinguished from all our
COMPOSITÆ except CARPESIIUM by the broad almost
leafy involucral bracts, five of which are sufficient to
surround the base of the head; and by the leaves which
have the nerves and veins deeply impressed on the
upper side, and are coated beneath with white hairs
between them.

Perennial herb with yellowish rhizome from which rise the stems, singly or in clumps. Stem branched or not, terete, usually dark purple in colour and scabrid with short hard whitish hairs on red bases. Leaf-stalks $1/16$ inch only, broad. Leaves ovate 2 by $3/4$ inch broadest near the rounded base, erect and the sides incurved upwards, though the margin slightly recurved; above very rough and parcelled out into small areas by the impressed reticulate veins, and below white between the raised green veins. Heads terminal, solitary: involucre hemispheric: bracts many seriate, the outer like small leaves, the inner progressively narrower with distinct mucro, the innermost scarious narrow-oblong. Florets slender, $1/2$ inch spreading; lobes $1/8$ inch by

1/30 inch, spreading. Anthers exerted, dark. Style exerted; arms subulate. Achenes white 1/8 inch, terete but obscurely ten-ribbed: pappus brown, 1/6 inch, fugacious. t. 148.

The spreading florets remind one of the Knapweed. After the fruits have dispersed the empty involucre remain some considerable time, the outer scales reflexed and chocolate brown in colour, the inner erect.

In the grass of the open downs, abundant in places. Flowers July to October. Pulneys: very common above Kodaikanal, Nilgiris. *Fyson* 2661, 525, 20491. *Bourne* 71, 1000, 1026. Not elsewhere.

VERNONIA.

F.B.I. 78 V.

Herbs, shrubs or even trees with alternate leaves and cymose panicles of flower-heads, characterised by the many rows of involucre bracts, narrow or broad but not leafy; the purple florets, all tubular and equal; a persistent pappus to the achene, which latter has ten ribs and often a circle of short scales round the flat top outside the pappus; and anthers cleft at the base.

Species about 400. Mostly in America and chiefly in the tropics. Not in Europe.

Known in America and the colonies as Ironweed; *Fr.* Vernonie, *Ger.* Bitterolse.

Herb with narrow acute involucre bracts . . . *V. conyzoides*.

Involucre bracts with long points and outer filiform
V. peninsularis Clarke.

Shrub with blunt, not narrow, involucre bracts
V. pectiniformis.

Dense shrub with round backed leaves, brown underneath.
V. cormorinensis.

Tree with slender, one-flowered heads *V. monosis*.

Vernonia peninsularis Clarke; *F.B.I.* iii 233, V 15. Distinguished from our other species by the long slender points to the involucre bracts.

Stem simple or branched, ribbed, covered with short or long hairs sometimes almost shaggy, flexible. Leaves 2 to 4 by 1½ to 2½ inches, shortly stalked,

elliptic-ovate, acute, crenate-serrate: on the underside gland-dotted and more or less woolly especially in the veins.

Heads few, 3 to 1 inch across, on stalks of $\frac{1}{2}$ to 2 inches, in open corymbs. Inner parts $\frac{1}{3}$ by $\frac{1}{12}$ inch, narrow oblong acuminate into a short or long often recurved awn; outer bracts with shorter broad part and outermost filiform (awn only). Receptacle $\frac{1}{6}$ inch: florets about thirty. Achenes nearly glabrous, strongly ribbed. Pappus pale reddish.

Pulneys: near Kodaikanal—Falconer shola, below Glen falls and at lower levels. *Bourne* 297, 310, * 770, * 1439, 1439, * 1440.* Also Travancore.

Closely allied to *V. bracteata* Wall. of the Himalayas and Khasi mountains.

***Vernonia conyzoides* DC.; Wight's Herb. Prop.** 1387!, not of *Wight Ic.*, t. 829; *F.B.I.*, under *V. cinerea* Less., iii 233, V 18 *. A sturdy herb distinguished among our species by its narrow pointed involucre bracts.

Stem ribbed, usually unbranched till near the flowering region, sturdy. Leaves erect: stalk $\frac{1}{4}$ to $\frac{1}{2}$ inch, broadened slightly and hairy at the insertion: blade very acute, ovate or oblong-lanceolate, 2 to 3 by $\frac{1}{2}$ to $1\frac{1}{4}$ inches irregularly serrate glabrous or nearly so on the upper side, very pubescent or tomentose with distinct nerves and reticulations on the under. Corymbs much branched, terminal on the main stem and leafy branches of the upper axils; pubescent with few or no bracts: ultimate peduncles $\frac{1}{8}$ inch, slender. Heads very numerous, $\frac{1}{4}$ by $\frac{1}{6}$ inch: outer bracts not much shorter than the inner, one-nerved, acute or spine-tipped, pubescent. Achenes hairy, surmounted by a rim of very short, outwardly directed scales: pappus hardly longer than the bracts, white. t. 149 (from *Bourne* 6323).

By woods. Pulneys: Kodaikanal and below. Nilgiris: Ootacamund. *Fyson* 2007, 1446, 2037, 1216. *Bourne* 4819.

Gen. Dist. South Indian hills at high levels.

Considered by some a form of *V. cinerea* Less., but very different from that plant as it grows on the Madras plains. Close to *V. candolleana* W. & A., but in that species the outer pappus scales erect and nearly half as long as the achene, and the latter glabrous.

Vernonia cormorinensis* Smith; V 32. A well branched dense shrub, peculiar in its arched leaves densely clothed underneath with yellowish hairs

Shrub 4 to 5 feet high and 5 to 7 feet broad; stems purplish brown and the whole plant up to the involucre thickly coated with yellowish hairs: leaf scars prominent as blunt crescents with three dark scars of the vascular bundles. Leaf-stalks $\frac{1}{4}$ inch: blades elliptic, up to 5 by 2 inches, very occasionally with shallow teeth; pubescent above and roughened by the impressed veins; lighter below and coated with yellowish hairs especially on the nerves, but not white; curving downwards with rounded backs. Flower-heads in dense terminal corymbose panicles 6 inches across, the branches of which have the same yellowish hairs, and also here and there linear scales with bulbous bases: ultimate peduncles $\frac{1}{3}$ to $\frac{1}{2}$ inch. Involucre $\frac{1}{3}$ by $\frac{1}{2}$ inch: bracts three-seriate, pubescent, with a few linear scales at the base; the outer greenish, the inner longer and tipped with purplish brown. Florets exerted $\frac{1}{6}$ inch, purple. Styler arms subulate. Achenes $\frac{1}{12}$ inch, five-angled and obscurely ten-ribbed, covered with white glistening points: pappus white, $\frac{1}{5}$ inch, with a ring of much shorter hairs, $\frac{1}{50}$ inch, outside. t. 150.

On the open downs. Pulneys: above Kodaikanal by roadsides, always in dense clumps. *Fyson* 2155. *Bourne* 230, 416, 1013, 1013,* 2687, 1351, 1375.

I have not seen Smith's type plant [Bot. Survey of India IV (1911), 283], but have been told by men who have seen it that mine is that plant. Certain differences between this description and his may be put down to his being made on a single dried specimen, while the above was done in the field. The curved backs of the leaves, not mentioned by Smith are very characteristic. In bud the leaves are erect with incurved edges and tip and have a thick coating of hairs. The figure shows this well.

Vernonia pectiniformis *Wight; Herb. Prop.* 1379!; *F.B.I.* as of *DC.*, iii 239, V 36. A shrubby plant with broad finely serrate leaves and wide corymbs of flower-heads, distinguished among our species by the smooth, blunt, not narrow bracts and rather long peduncles.

Stem terete, striate, pubescent or glabrous. Leaves ovate acute, very closely serrate, narrowed abruptly to the $\frac{1}{2}$ -inch stalk: nerves many, $\frac{1}{8}$ inch apart, conspicuously parallel. Corymbs 3 to 5 inches, by forking of the stem and upper branches; bracts at the forkings very small or absent; ultimate peduncles $\frac{1}{3}$ to $\frac{1}{2}$ inch. Heads as long. Involucral bracts many-seriate, imbricate, lengthening evenly from the lower and outermost to the inner. Corolla $\frac{1}{3}$ inch, its tube $\frac{1}{6}$ inch. Achenes ten-ribbed, densely glandular but not hairy. Pappus $\frac{1}{2}$ inch. t. 151. *Wight Ic.* t. 1077; *Sp. Nilg.* t. 103.

Nilgiris: near Ootacamund, etc., common. Flowers from April onwards. Also Ceylon. *Fyson* 2212.

Vernonia monosis *Benth.; Herb. Wight Prop.* 1376!; *F.B.I.* as var *wightiana* of *V. arborea* *Ham.* 3; iii 239, V37.* A tree, conspicuous in the Nilgiri sholas of April and May as a huge white cone or ovoid crown of pappus and pale purple flowers with the scent of Heliotrope.

Tree up to 40 feet, with trunk 18 inches thick, but often smaller; branches round with narrow leaf-scars extending right across; youngest parts, underside of leaves and inflorescence densely tomentose. Leaf-stalks $\frac{1}{3}$ to $\frac{3}{4}$ inch, broadened at the base: blade elliptic entire, when dry with the smell of fresh hay (not cumurin), rounded and often oblique at the base, with about nine pairs of main veins. Flower-heads almost umbelled, the umbels again compounded into rounded masses at the ends of the branches forming leafy panicles 5 to 6 inches high and 4 to 5 inches wide, terminating the year's

shoots. Involucre tubular, $\frac{1}{4}$ by $\frac{1}{16}$ inch, bracts many in four or five series; all but the innermost covered except on the margins with white tomentum; innermost thin, glabrous. Flower one only, mauve-coloured, nearly as long again as the involucre. Style exserted well above the perianth. Achene cylindrical, $\frac{1}{16}$ by $\frac{1}{20}$ inch, very faintly ten-ribbed, white; pappus hairs all equal, twice as long, dirty white. t. 152. Wight Ic. t. 1085.

The leaves are the largest of all our trees except those of *Meliosma wightii* and the leaflets of *Heptapleurum* and *Brassaia*.

In sholas. Nilgiris: up to at least 7,000 feet, especially common on the borders of our area; Pykara and below (a very fine specimen 35 to 40 feet high with trunk 18 inches near the short cut to Glen Morgan estate on the Waterfall road; Kotagiri: flowering early in May. *Fyson* 1720, 2494. *Bourne*. *Collected by Rangachari*. *Hohenacker* 449, 1341. *Wight Kew Dist.* 1526: *Munro* in 1850 "on Coonoor Ghat."

V. arborea *Ham.*, with which it is included in the F.B.I., is a Nepal plant with nearly orbiculate glabrous leaves and broader heads of six flowers. The spreading pappus of the six achenes gives to the fruiting involucre a very different appearance from the close brush of one-flowered heads of our plant.

ADENOSTEMMA.

Sticky herbs with opposite leaves and terminal corymbs of flower-heads, with florets all tubular and similar and anther bases rounded (not tailed); and distinguished by the anthers being cut off square at the top with hardly the flap usual to the family, and the achenes having for pappus four or five club-shaped scales.

Species under 10, all but ours American.

• *Adenostemma viscosum* *Forst.*; *F.B.I.* iii 242, VII 1. An annual of 2 to 3 feet, sticky in all the younger parts. Leaves stalked broadly ovate or deltoid, serrate, with broadly triangular base. Stalks of the flower-heads, slender, sticky. Involucre hemispheric, $\frac{1}{4}$ inch:

bracts obtuse, sticky. Florets $\frac{1}{4}$ inch. Achenes sticky.
t. 153, *a.* achene ; *p.* section across *a.*, showing shape.

On the plateaus but commoner at lower levels.

Gen. Dist. Throughout India and all tropical countries.

AGERATUM.

F.B.I. 78 VIII.

Herbs with opposite leaves, florets all equal and tubular, blue or white never orange, anthers not cleft at the base, stylar arms obtuse, achenes five-angled with five scales for a pappus.

Species about 16 probably all American in origin but now distributed throughout the tropics.

Floss flower, Maudlin ; *Fr.* Agerate ; *Ger.* Leberbalsam.

Ageratum conyzoides Linn. ; F.B.I. iii 243, VIII ; a Floss Flower ; remarkable for the long protruding purple styles. Stem 3 to 5 feet, well branched, terete, sparingly hairy. Leaves opposite, stalked, ovate-crenate, about 2 by $1\frac{1}{4}$ inches in corymbs, terminal on the stem and upper branches, with linear bracts at the forkings ; ultimate peduncles slender $\frac{1}{8}$ to $\frac{1}{2}$ inch. Involucral bracts $\frac{1}{8}$ to $\frac{1}{6}$ inch, aristate. Florets purple, stylar branches long, purple. Achenes black, $\frac{1}{8}$ inch, with a rim of five to ten pointed scales about as long. t. 154.

Very common in masses by road-sides in Ootacamund and Kodaikanal, e.g., just below the bund. Distributed throughout India and in all warm countries. *Fyson* 2850. *Bourne* 2688.

EUPATORIUM.

F.B.I. 78 IX.

Herbs or shrubs with opposite (or alternate) leaves and terminal corymbs of flower-heads characterised by the florets all equal and tubular, stylar arms long and obtuse, achene five-angled or five-ribbed, and pappus of a single circle of long scabrid hairs (distinction from *AGERATUM*).

Species about 400, chiefly American.

In England we have *E. cannabinum*, Hemp-Agrimony, *Ger. Wasserdosten*, which is abundant on the temperate Himalayas and occurs also in Khasia and Burma.

Named from one Mithridates Eupator who is said to have brought the plant into use.

Eupatorium glandulosum *H. B. & K.*; IX 3. Stem 3 to 6 feet, shrubby, reddish, branched, very glandular on all the young parts and scented with a peculiar acrid odour. Leaves opposite: stalks 1 to 2 inches: blades 1 to 3 by $\frac{3}{4}$ to $1\frac{1}{2}$ inches, thin, trapezoid or almost triangular, with very broadly wedge-shaped and almost horizontal base, crenate-dentate except the basal margin. Flower-heads white in terminal glandular masses, $\frac{1}{3}$ inch, many-flowered: involucral bracts about twenty in two rows, lanceolate acute, shorter than the florets, with two well-defined nerves and scarious margin. Florets white, fragrant: corolla tube $\frac{1}{6}$ inch, slender. Styler arms long and far exserted, divergent. Achenes black, glabrous, $\frac{1}{10}$ inch, slender, crowned by a pappus of ten to twelve white scabrid hairs, twice as long. *Bot. Mag. t. 8139.*

A garden plant, native of Mexico, common as an escape by road-sides in Ootacamund. *Fyson 2039, 3020.*

DICHROCEPHALA. F.B.I. 78 XII.

Round-head.

Annual herbs with alternate toothed or cut leaves, and distinguished from all our COMPOSITÆ by the small and almost perfectly spherical flower-heads composed of perfect bisexual florets at the top and narrow female flowers round the sides. Anther bases rounded. Styler arms short flattened. Achenes compressed without pappus or with two small scales.

Species 4 or 5 in Asia and Africa.

Dichrocephala chrysanthemifolia DC. (*including D. latifolia* DC.); *F.B.I.* iii 245, XII 1; Round-head. An untidy weed with small chrysanthemum-like leaves, widely divergent branches, and small spherical purplish flower-heads.

Stem erect or decumbent; all green parts covered with short hairs: branches diverging widely. Leaves flaccid, with dull surface, coarsely lobed and toothed, the lowest 2 to 3 inches, pinnatifid or lyrate with broad terminal lobe and narrower lateral ones (*D. latifolia*); upper leaves 1 inch, oblong coarsely toothed or pinnatisect, not stalked, clasping the stem with broad auricles (*D. chrysanthemifolia*); or often all leaves one kind or all the other kind. Peduncles $\frac{3}{4}$ to $1\frac{1}{2}$ inches, the longer with a small bract, straight, divaricating. Heads $\frac{1}{6}$ to $\frac{1}{3}$ inch, spherical. Florets all tubular; outer ones very slender, tubular with four small teeth, appearing to the naked eye as short thick white rods, with style but no stamens; middle ones (about fifteen) larger, campanulate with four spreading lobes, bisexual. Achenes obovate, compressed, without pappus. *tt.* 155, 156, 157. *Wight Ic.* *tt.* 1095, 1096; *Sp. Nilg.* *t.* 108.

Very variable as regards its leaves, and hitherto regarded as two species. My plant No 2985 (*t.* 156), collected on the Kodaikanal downs September 1912, has the characters of both type plants, *D. latifolia* DC. *Wight Cat.* 1412 (*t.* 155) and *D. chrysanthemifolia* DC. *Wight Cat.* 1413 (*t.* 155). *Fyson* 2985, 300, 2036, 3929. *Bourne* 1167, 407.

On both plateaus, on the open downs.

Gen. Dist. Mountains of India from Kashmir to Ceylon, tropical Asia and Africa.

MYRIACTIS.

F.B.I. 78 XV.

A small genus of perhaps only one species, belonging to tropical Asia and Africa; characterised by the broad flat and daisy-like heads, naked disc, narrow bracts, long strap-shaped, white or blue never yellow, rays,

anthers without tails and achene with short beak but no pappus (distinction from *ASTER*).

Species 3 or perhaps 1 only in Java, India and central Asia.

Myriactis wightii Wight; *Herb. Prop.* !; *F.B.I.* as of DC., iii 247, XV 1. Stem 5 to 20 inches, pilose. Leaves mostly from near the ground oblanceolate, more or less coarsely toothed or lobed or lyrate, 2 to 3 inches, upper ones $1\frac{1}{2}$ inches, entire, oblanceolate. Flower-heads $\frac{3}{4}$ to 1 inch, solitary on long axillary scapiform branches (peduncles) in the upper axils: involucral bracts narrow, all equal. Ray florets $\frac{1}{2}$ inch, purplish blue or white; limb $\frac{1}{2}$ inch. Disc florets campanulate, four-lobed, yellow. Achenes egg-shaped, contracted just below the broad summit without pappus. t. 158. Wight Ic. 1091; Sp. Nilg. 107.

Nilgiris: near Ootacamund. Pulneys: near Kodaikanal and above (*Bourne*). Also Ceylon.

ERIGERON.

F.B.I. 78 XXII.

Fleabane.

Annual or perennial herbs with alternate or radical leaves and rayed flower-heads (of the *ASTER* kind) often long stalked; and characterised by the ray florets white or blue never yellow, in two or three circles; involucral bracts many and narrow; and pappus hairs slender and in one circle.

Species perhaps 150, widely distributed in temperate regions and the mountains of both hemispheres, some being ubiquitous weeds. In Britain three species, *Fleabane*, *Ger. Beschreikraut*, *Fr. Vergerette*.

Very closely allied to *ASTER*, which however has but one circle of ray florets (except of course garden "doubles").

Erigeron alpinus Linn.; *F.B.I.* iii 255, XXII 5. Root-stock horizontal, thick. Stem 8 to 12 inches, unbranched

hairy. Leaves mostly radical, oblanceolate, 2 to 3 inches, upper smaller to $\frac{1}{2}$ inch. Flower-heads few, terminating the stem or peduncled in the upper axils: involucre bracts narrow, in two series, all much alike. Ray florets numerous, in two or more circles, with two small teeth or none at the end of the strap, easily withered. Disc florets narrow-cylindrical, not much broader at the top, five-toothed. Anther bases entire, narrowed. Styler branches with thickened stigma. Achenes hairy with a single circle of under twenty reddish pappus hairs. t. 159.

Nilgiris: on the open downs and by road-sides in Ootacamund. *Fyson* 1802, 2512. *Bourne* 4618, 5097.

Gen. Dist. Mountains of north temperate zone, very variable and widely distributed.

***Erigeron mucronatum* DC.; XXII 8.** Stem and branches slender, from a woody base; hairs sparingly scattered all over the plant. Leaves mostly narrow elliptic or oblanceolate $\frac{1}{2}$ to $1\frac{1}{2}$ inches; some also much larger, ovate or spatulate, entire or coarsely three-toothed or lobed, narrowed to the stalk. Flower-heads solitary, terminal. Involucre of two or three rows of narrow subulate bracts, $\frac{1}{4}$ to $\frac{1}{3}$ inch long, flat. Ray florets white turning pink, oblong-oblanceolate with a minute notch disc florets slender. Achene scabrid: pappus of $\frac{1}{8}$ inch long hairs with a few much shorter outside.

A native of Mexico universal in gardens and originally cultivated under the name *Vittadenia triloba*.

This species has, in South India, been confounded with *Vittadenia australis* *A. Rich.*, an Australian plant which is much more robust in every way.

***Erigeron canadense* Linn.** A robust well branched herb with narrow, almost linear leaves, $1\frac{1}{2}$ to 3 inches long, and purple tipped involucre bracts.

A weed of road-sides in Ootacamund and Coonoor. *Bourne* 4668, 4619,

CONYZA.

F.B.I. 78 XXIV.

Herbs with alternate leaves and terminal corymbs of flower-heads without rays and the florets apparently all similar, but the outer two or three circles slender, two or three-toothed, without stamens and pale gold in colour, the inner florets five-toothed complete with stamens. Anther bases not divided. Styler arms flattened. Achenes small pappus hairs about ten, short, dilated.

Species about 50 chiefly tropical and sub-tropical, a few in temperate regions.

Conyza stricta Willd. ; *F.B.I.* iii 258, XXIV 6; Kodai-kanal Groundsel. A small herb with numerous small unrayed yellow $\frac{1}{8}$ -inch flower-heads, of very slender florets and pappus, in much branched terminal corymbs.

Whole plant pubescent, 1 to 2 feet, branched upwards. Leaves obovate and coarsely serrate to oblanceolate-oblong entire, dull-green, erect. Heads very numerous in corymbs, terminal and from the upper axils: alternate peduncles slender $\frac{1}{8}$ to $\frac{1}{2}$ inch. Involucral bracts $\frac{1}{8}$ inch, narrow with scarious edges, densely pubescent. Outer florets tubular, very slender, minutely toothed: inner bell-shaped ones few, five-lobed. Achenes slender, $\frac{1}{40}$ inch, pappus hairs few and fine.

In waste places and dry soil very common on the plateaus especially near the observatory at Kodaikanal. *Fyson* 287, 721. *Bourne* 519.

Gen. Dist. South-east Himalayas and the South Indian mountains.

BLUMEA.

F.B.I. 78 XXVI.

Annual or perennial herbs with alternate woolly or glandular pubescent leaves, often strongly scented. Flower-heads variously arranged; without rays, and all the florets tubular and apparently similar; but several outer circles slender two or three-toothed, without stamens. Inner few (or absent), five-toothed; anther bases

divided into short slender tails. Styler arms flattened : achenes small with a single circle of slender caducous pappus hairs.

Species about 60 in tropical and sub-tropical parts of Asia, Africa and Australia, very common in India.

A very difficult genus, the species being inconstant in leaves and other respects.

Blumea neilgherrensis Hook. f. ; *F.B.I.* iii 261, XXVI

4. Strongly aromatic and woolly all over. Leaves obovate acute, from 3 to 4 by $1\frac{1}{4}$ to 2 inches near the base to 1 by $\frac{1}{2}$ inch near the flowering part, sharply dentate-serrate with teeth $\frac{1}{8}$ to $\frac{1}{6}$ inch apart. Heads numerous soft : involucral bracts very slender, woolly. Florets purple, pappus copious.

On the open downs, flowers in June. Nilgiris : common. Pulneys beyond the Observatory.

Gen. Dist. South Indian hills, Nilgiris, Pulneys, Courtallum.

Blumea (?) *barbata* DC. ; *F.B.I.* iii 262, XXVI 6. Stem usually unbranched, 15 to 20 inches, softly hairy or shaggy. Leaves up to 4 by 2 inches, elliptic, narrowed to the base, sharply toothed with one or more smaller teeth between the larger. Flower-heads in a compact mass opening out in fruit to a panicle. Involucral bracts linear, shaggy. Achenes small, ribbed. Pappus white.

Pulneys : in Kodaikanal. *Bourne* 579, 2039.

I have not collected this myself, nor verified the naming. *F.B.I.* describes the plant and leaves as altogether smaller than the above, and the achenes as minute, striate above ; which does not agree with Bourne's plant.

Blumea hieracifolia DC. ; *F.B.I.* iii 263, XXVI 11. Stem usually unbranched, erect, 1 to 2 feet. Leaves mostly near the ground and forming a rosette, obovate spatulate, serrate ; undersides woolly, as also the upper parts of the stem and especially the involucre. Heads close together in one or more compact masses, forming elongate panicles : bracts narrow, hairy, the inner

purple-tipped and longer than the outer: receptacle naked. Florets yellow. Pappus copious, white. Wight Ic. t. 1099.

Nilgiri and Pulney downs. Flowers in May. *Fyson* 363. *Bourne* 1100,* 1109, 2097.

Gen. Dist. Hilly parts of India.

LAGGERA.

F.B.I. 78 XXVII.

A small genus, distinguished among all our COMPOSITÆ by the wings on the four angles of the stem and branches. Annual or perennial herbs with alternate leaves, decurrent as wings, and loosely paniced unrayed flower-heads characterised by the involucral bracts in several series; the outer shorter than the inner, rather rigid and spreading: receptacle without scales: florets all tubular and slender, the outer in several series, female only; the central ones complete: anther bases divided: achenes with one circle of hairs. Very similar to BLUMEA in most respects, but the anther bases less cordate. Our species, however, are most easily distinguished by the winged stems.

Species about 10 in tropical Africa and India.

Wings entire, stem sturdy L. *alata*.
Wings cut up irregularly: stem slender . . . L. *pterodonta*.

Laggera alata *Schultz*; *F.B.I.* iii 271, XXVII 2. Stem as thick as a lead pencil, very rough with hardened leaf-bases, in the younger parts densely pubescent, almost woolly and winged by the decurrent margins of the leaves. Leaves broadly-oblong to ovate or oblong, 2 to 4 by $\frac{3}{4}$ to $1\frac{1}{4}$ inches at the widest and $\frac{1}{2}$ inch at the base, on the younger branches $\frac{3}{4}$ inch only in length; ovate, sharply serrate with triangular teeth $\frac{1}{16}$ to $\frac{1}{8}$ inch apart, pubescent above, tomentose below especially on the nerves. Flower-heads peduncled in the axils of the upper leaves of short lateral branches

2 to 6 inches long, forming a large terminal leafy panicle. Peduncles often with one or two small leaves, then winged, erect but slightly decurved so that the flowers face downwards. Heads conical, $\frac{1}{2}$ by $\frac{1}{4}$ inch, with flat base ; lower bracts recurved, stiff. Wight Ic.t. 1101.

On the open downs of both plateaus, flowering in the winter months. *Fyson* 2306, 2670, 2672. *Bourne* 53.

Gen. Dist. Mountains of India proper, tropical Africa, Java, China and Philippines.

The stems die down or are burnt down every year, and the young shoots which come up after the first rains have large soft leaves smelling strongly of Black-currant.

Laggera pterodonta Benth. ; *F.B.I.* iii 271, XXVII 3. Stem and branches slender, glabrous : wings very irregular, interrupted and deeply toothed. Leaves glabrous, thin, ovate lanceolate or oblanceolate, sessile, toothed or pinnatifid at the base ; on the main stem 5 by 1 to 2 by $\frac{1}{2}$ inch ; on the branches smaller. Flower-heads peduncled in the upper axils, purple. Wight Ic. t. 1100.

On both plateaus. *Bourne* 1560.

Gen. Dist. Mountains of South India, tropical Himalayas, Assam and Burma, tropical Africa.

Smell of young leaves faint, and rather like that of a Strawberry.

ANAPHALIS AND HELICHRYSUM.

F.B.I. 78 XXXIX & XLIII.

Cudweed, Everlasting, etc.

Characterised chiefly by the scarious glistening bracts which stand up round the flower-head (*Cudweed*) or spread out as a white border round it (*Everlasting*) : also by the arrangement of the heads in close masses, and by a cottony covering on all greer parts. Florets all tubular, slender : outer ones female only (without stamens but) fertile : inner with stamen and style but infertile. Achenes with pappus of simple hairs.

The differences between the genera are minute and difficult of determination.

ANAPHALIS:—30 species in Asia, in mountain climates of the warmer zones; a few in Europe and North America.

HELICHRYSUM:—300 species half of them in South Africa, others in Australia, tropical Africa, south Europe and the Mediterranean region: in India only a few.

In England four species of **GNAPHALIUM** and of **FILAGO** constitute the "Cudweeds"; *Ger.* Ruhrkraut; two species of **ANTENNARIA** are "Everlasting."

- | | | | |
|---|---|--|---|
| a | { | Stem woody below and much branched: plants in dense rounded masses | b |
| | { | Stem not woody nor much branched | e |
| b | { | Leaves $\frac{1}{2}$ inch broad by 2 to 3 inches long | c |
| | { | Leaves $\frac{1}{2}$ to $\frac{1}{8}$ inch broad by $\frac{1}{2}$ to 1 inch long | d |
| c | { | Flower-heads $\frac{1}{8}$ inch. "Cudweed." <i>p.</i> 228. <i>A. beddomei</i> . | |
| | { | Flower-heads $\frac{1}{4}$ inch. "Everlasting" <i>p.</i> 229. <i>A. travancorica</i> . | |
| d | { | Leaves $\frac{1}{2}$ inch close set: heads $\frac{1}{4}$ inch <i>p.</i> 233. <i>A. neelgerriana</i> . | |
| | { | Leaves $\frac{3}{4}$ inch: heads $\frac{2}{5}$ inch <i>p.</i> 232. <i>A. bournei</i> . | |
| e | { | Leaves more or less white on both sides | f |
| | { | Leaves glabrous or nearly so above, white below | g |
| f | { | Leaves $\frac{3}{4}$ by $\frac{1}{2}$ inch: heads $\frac{1}{4}$ inch. 'Everlasting.' <i>p.</i> 231. <i>A. leptophylla</i> . | |
| | { | Leaves oblong or obovate: heads small condensed <i>p.</i> 230. <i>A. oblonga</i> . | |
| g | { | Leaves one-nerved | h |
| | { | Leaves five to seven-nerved <i>p.</i> 233. <i>H. buddleioides</i> . | |
| h | { | Leaves $1\frac{1}{4}$ inches sticky, with auricled base and tapering to the tip: heads pink $\frac{1}{8}$ inch <i>p.</i> 231. <i>A. aristata</i> . | |
| i | { | Leaves bluntly pointed $\frac{1}{4}$ inch "Everlasting." <i>p.</i> 232. <i>A. wightiana</i> . | |

Anaphalis beddomei *Hook.f.*; *F.B.I.* iii 282, XXXIX

12. Grows in loose masses, 2 to $2\frac{1}{2}$ feet high, the stems ending in irregular cymose corymbs of small flower-heads.

Main stem decumbent 1 inch thick, with brown scaly bark; stems or branches numerous curving upwards, clothed below with dead leaves, above with green more or less erect leaves, 1 inch apart. Leaves oblanceolate,

clothed above and below with close wool, which however does not hide the five, or at the base seven, veins prominently raised in the lower side, but impressed in the upper and curving forwards to meet at the tip. Flower-heads in small corymbs, on peduncles, the outer of which are much the longer, so that the whole inflorescence is depressed in the centre; bracts oblong, all close set against the axis, the lowest 1 inch; central corymbs opening and fruiting first. Heads small, the involucre campanulate, $\frac{1}{8}$ by $\frac{1}{6}$ inch: bracts glistening white, oblong or rounded not spreading. Disc $\frac{1}{10}$ inch or more across, florets all tubular. Corolla $\frac{1}{10}$ inch above the minute ovary. Achenes very small, pappus of white hairs. After the fall of the fruits the receptacles appear as small discs $\frac{1}{16}$ inch diameter surrounded by a wing $\frac{1}{8}$ inch wide, the inner half brown, the outer glistening white.

Easily distinguished from *A. travancorica*, which it much resembles in growth, by the smaller more spreading leaves, set at longer internodes, and the small flower-heads in loose corymbs. t. 160.

On the Pulney downs, common. *Fyson* 524, 2101, 2074. *Bourne* 2009, 2697, 2698.

Named by Sir Joseph Dalton Hooker after Col. Beddome who sent the plant to Kew about 1880.

Anaphalis travancorica *Smith*; XXXIX 12. * Grows in dense whitish tufts, 1 to 2 feet in height and up to six feet across, of numerous stems that end in closely packed very cottony oblanceolate leaves and are clothed below by the dead ones; the flower-heads $\frac{1}{3}$ inch across in bunches of 2 inches diameter, raised a few inches only above the general level.

Main stem woody, an inch thick, decumbent on the ground; upright stems as thick as a lead pencil, clothed for the most part with numerous brownish-grey dead

leaves, above very cottony. Leaves close set except near the flowering region, $\frac{1}{4}$ inch only apart, oblanceolate or spatulate, acute, clasping the stem by a broad base, concealed by cottony web: midrib prominent, but the pair of lateral nerves visible only when the cottony covering is removed: and margin reflexed. The lower of the still green leaves spread outwards, the younger arching over the bud.

Flower-heads in close panicles, the lower branches of which are half as thick as the stem: lower bracts leaf-like, upper triangular acute, and uppermost, close under each flower-head, very cottony except for the scarious tip. Involucral bracts many-seriate, the ends of the outer reflexed and forming a glistening white fringe $\frac{1}{16}$ inch wide round the disc; the innermost erect, oblanceolate-oblong and green except at the tip. Disc $\frac{3}{16}$ inch remarkably uniform in size, without ray florets. Florets all tubular, $\frac{1}{10}$ inch, their upper halves yellow. Styler arms short, broadened at the ends. Achenes brown, $\frac{1}{100}$ inch, nearly cylindrical, densely papillate; pappus hairs as long as the corolla, few, in a single circle. After the dispersion of the fruits the receptacles appear as greenish papillate discs surrounded by flat wings $\frac{1}{8}$ inch wide of narrow bracts. t. 161.

Quite common on the Pulney downs, above Kodaikanal especially where exposed to alternate dry winds and fog. *Fyson* 535, 1068, 1839, 2159. *Bourne* 1112, 420, 1560, 1562,* 2010, 2052.

Anaphalis oblonga DC.; *F.B.I.* iii 283, XXXIX 14; common Cudweed, pink or white flowered.

Stem cottony, often unbranched below the flowering region, 1 to 2 feet; base clothed with dead leaves. **Leaves** sessile, erect, oblong or oblanceolate, acute, usually $\frac{3}{4}$ to 1 by $\frac{1}{8}$ to $\frac{1}{6}$ inch, but in extreme cases 2 by $\frac{1}{2}$ inch; one-nerved, cottony; margin flat; base broad.

Heads in compact masses, arranged in broad depressed terminal corymbs: involucreal scales shining white or pink. Very variable as regards size of leaf. t. 162.

Common everywhere on the plateaus, especially on rather poor soil and then often only 3 to 4 inches high. *Fyson* 274, 1062, 1069, * 2906, 2987. *Bourne* 710, 578, 1032, * 1039, * 2699, 1561, 2699, 5247.

Gen. Dist. Western Ghats and Ceylon.

***Anaphalis leptophylla* DC. ; F.B.I. iii 285, XXXIX 21 ;** White Everlasting. Distinguished from *A. oblonga* by its much narrower leaves and larger flower-heads.

Stem slender, usually unbranched, silvery white with closely appressed hairs. Leaves linear or linear oblanceolate, $\frac{1}{2}$ to 1 inch, mucronate: midrib strong: margin revolute. Heads when fully open $\frac{3}{8}$ inch, pure white with yellow centre: lower half of bracts scarious with green nerves, glistening: upper half spreading outward as a fringe round the disc: disc $\frac{1}{4}$ inch yellow: receptacle glabrous. Achenes ovoid. Pappus hairs feathery towards the base.

Pulneys: in damp places and on poor ground, on the downs. Nilgiris. *Fyson* 474, 1069. *Bourne* 5205, 5228.

***Anaphalis aristata* DC. ; Herb. Wight's Prop. 1470! ; F.B.I. iii 285, XXXIX 22 ;** Green Cudweed. A green plant with sticky leaves and small flower-heads.

Stem woody at the base with numerous, erect, flowering branches, glandular-pubescent but not cottony. Leaves clasping the stem with acute auricles, oblong, acute or tapering from the clasping base to the apex, $1\frac{1}{4}$ to 2 inches by $\frac{1}{6}$ to $\frac{1}{3}$ inch; margin recurved; lower side white with single midrib; apex mucronate and turned downwards. Heads very numerous $\frac{1}{8}$ inch, bunched in more or less compact lumpy corymbs; bracts glistening rounded, with minute teeth rose coloured

when young, afterwards bleaching at the tips. t. 163.
b. fertile pistillate flower; *c.* staminate flower. [*E.T.B.*]
 Wight Ic. IIII9.

Pulneys: Kodaikanal downs, etc. Nilgiris: Avalanche, etc. (*Wight*). *Fyson* 1063. *Bourne* IIII, IIII.*

Anaphalis wightiana DC.; *F.B.I* iii 286, XXXIX 23;
 Green Everlasting. Distinguished from *A. aristata* by
 its larger ($\frac{1}{4}$ inch) flower-heads and its thicker, shorter,
 blunter and more numerous leaves.

Stem to 12 inches woody below and clothed with dead
 leaves; branching corymbosely above. Leaves white
 underneath, green on the upper side, oblong obtuse,
 one-nerved, with short recurved tip, revolute margin,
 and broad stem-clasping base: upper leaves erect and
 closely appressed to the stem and those near the
 flower-heads cottony. Heads $\frac{1}{4}$ inch rather long, with
 several rows of bracts, cottony: disc $\frac{1}{8}$ inch, margin
 of acute bracts $\frac{1}{16}$ inch: peduncles and lower part
 of involucre densely cottony or tomentose. t. 164.
 Wight Ic. t. IIII7.

In damp and cool places, on banks of streams, etc. Nilgiris:
 on the downs common especially towards Pykara. Pulneys:
 near Kodaikanal. *Fyson* 668, 1086. *Bourne* 419, 2700, 2701.

Anaphalis bournei *Fyson*, *Sp. Nov.*; *F.B.I.* included
 in *A. brevifolia* DC., iii 286; XXXIX 26*; *Bourne's*
 Everlasting.

Stem shrubby below and much branched, the whole
 plant as a rounded lump with the habit of *A. beddomei*
 and *A. travancorica*: covered with a closely appressed
 felt of white hairs. Leaves $\frac{1}{3}$ to $\frac{1}{2}$ by $\frac{1}{12}$ inch, acute;
 upper erect and appressed to the stem, lower spreading:
 margin revolute; midrib distinct. Flowering branches
 6 to 10 inches, somewhat less leafy upwards. Heads $\frac{1}{4}$
 inch: border of white scales $\frac{1}{12}$ inch. t. 165.

Pulneys : by road-sides above Kodaikanal lake, common. *Fyson* 1061, 3030, 3031. Not elsewhere. Wight Kew Dist. (at Kew) No. 1630. *Bourne* 418, 918, 1506, 2695, 2696.

Closely allied to *A. brevifolia* DC. ; a Ceylon species, but differing in its narrower longer leaves not in general closely appressed to the stem and more widely spreading on the scapes. Plants from Kotagiri, Courtallum, and the Anamalais seem to be intermediate between these two.

Anaphalis neelgerriana DC. ; *F.B.I.* iii 287, XXXIX 27 ; the Nilgiri Everlasting. A white very small-leaved shrub characteristic of dry and exposed situations on the Nilgiris.

At its best 3 or 4 feet high and as broad, with numerous ascending, usually opposite branches, clothed below by the dead leaves : bark of stem rough and corky. Leaves bluey-white, $\frac{1}{4}$ by $\frac{1}{20}$ inch, coated with soft white cotton closely appressed to the surface, with recurved margins and one central vein : when young erect, later spreading, and finally depressed close against the axis and persistent there, very numerous and close set. Heads in open corymbose panicles 2 to 3 inches, across terminating erect branches 4 to 5 inches high, clothed to the top with closely appressed leaves : disc $\frac{1}{6}$ to $\frac{1}{5}$ inch, surrounded by a white rim of involucre bracts $\frac{1}{16}$ inch. t. 166. Wight Ic. 478.

In dry and exposed places. Nilgiris : top of Vengadu 7,500 feet, abundant, but not on the slopes ; hill above Pykara 7,500 feet, luxuriant near the cairn but not below ; in crevices on the precipitous rocky face of Vellingiribetta, 8,250 feet ; a few plants on the road-side near Pykara bridge but poor. Not Pulneys. *Fyson* 2628. *Bourne* 2694, 4663.

On the Pulneys this plant is represented by *A. bournei*.

Helichrysum buddleoides DC. ; *Wight's Herb. Prop.* 1465 ! ; *F.B.I.* iii 290, XLIII 1 ; broad-leaved Cudweed. Distinguished from all others of this group by its broad five to seven-nerved leaves, and masses of small yellow flower-heads.

Stem 2 to 4 feet, white above, $\frac{1}{6}$ inch thick. Leaves elliptic lanceolate or oblanceolate, acute, spreading, 2 to 4 by $\frac{1}{2}$ to 1 inch, green and glabrous above, white, as are all the other green parts, with thick adpressed tomentum, underneath; nerves five to seven raised. Corymbs terminal, 4 to 8 inches across; clusters of flower-heads globose $\frac{1}{2}$ to 1 inch. Heads yellow, $\frac{1}{6}$ inch, outer bracts woolly inner glistening. Anthers with long slender tails. Achenes scabrid, with pappus of scabrid hairs. t. 167. *c.* tubular floret; *d.* filiform floret [E.T.B.]. Wight Sp. Nilg. t. III; Ic. t. III3.

Nilgiris: on Snowdon; flowers in January. Coonoor Pulneys: at lower levels—Shembaganur. *Fyson* 660, 1026, 2405.

Gen. Dist. Western Ghats, Mysore, Bababooduns, Anamalais and Ceylon.

GNAPHALIUM.

F.B.I. 78 XLII.

Gnaphalium luteo-album Linn.; *F.B.I.* iii 288, XLII 1.

A small herb with very much the habit and general appearance of narrow leafed specimens of *Anaphalis oblonga* DC., but with dense leafless clusters of small golden glistening flower-heads, of which all the florets are fertile, may be found on the Ootacamund downs but is not, I believe, common. *Bourne* 5099.

Gen. Dist. Distributed all over India.

CARPESIUM.

F.B.I. 78 XLVIII.

Herbs with alternate leaves and fairly large yellow drooping unrayed flower-heads, distinguished among our COMPOSITÆ by the large, leaf-like, outer bracts, and the long sticky achenes. Florets all tubular but the outer without stamens. Anther cells with slender tails, stylar arm linear obtuse connivent. No pappus.

Species under 10 in Europe, temperate and sub-tropical Asia.

Carpesium cernuum *Linn.*; *F.B.I.* iii 300, XLVIII 1. Hairy all over. Leaves up to $\frac{1}{6}$ by 3 inches, elliptic or ovate lanceolate, narrowed to the sessile base. Heads $\frac{1}{3}$ to 1 inch.

Near Ootacamund and Kodaikanal in several sholas. *Bourne* 1477, 4634, 5246.

The species is very variable and is a common weed in the Himalayas. *Gen. Dist.* From Caucasus to France, Java, Japan.

CHRYSOGONUM.

F.B.I. 78 L.

Herbs or undershrubs with opposite toothed or pinnately compound leaves and flower-heads of the HELIANTHOIDEÆ (see p. 209), and characterised by having floral scales all over the receptacle: ray florets (without stamens) alone fertile and their achenes flattened back and front and embraced by these scales: pappus: very small or 0: disc florets with stamens and undivided styles, unfertile.

Species 6, in Australia 3, India 2, America 1.

Chrysogonum heterophyllum *Benth.*; *F.B.I.* iii 303, L 1. Annual, glabrous 3 to 4 feet. Leaves pinnate or pinnatifid: leaflets or segments ovate-lanceolate acute, sharply serrate or gashed, pilose above, pubescent underneath. Flower-heads in irregular umbels or corymbs; ultimate peduncles $\frac{1}{2}$ to 2 inches. Involucral bracts three or more-nerved irregular in length; outer long and green; inner shorter. Ray florets white: inner yellow. Achenes without pappus. *Wight Sp. Nilg.* t. 110.

Very common round woods on the Pulney and Nilgiri downs. Flowers from March to August. *Fyson* 3032, 1079,* 1441. *Bourne* 445, 473.

Gen. Dist. Also Ceylon.

Chrysogonum arnottianum *Benth.*; *F.B.I.* iii 303, L 2. Similar to the above but leaves larger and flower-heads

larger, 1 to 1½ inches diameter and with more ray florets. Wight Ic. t. 1105.

Nilgiris.

SIEGESBECKIA.

F.B.I. 78 LII.

A small genus of but two species, one cosmopolitan in all warm countries, the other in Peru.

Siegesbeckia orientalis Linn.; F.B.I. iii 304, LII 1. Remarkable for the four or five, ½ inch long, narrow sticky bracts below the globular flower-heads.

Stem 1 to 3 feet, pubescent, cymosely branched upwards. Leaves opposite, stalked, 2 to 3 by 1 to 1½ inches, ovate coarsely round-toothed, and deltoid base. Heads terminal, peduncled in the cyme forkings: outer bracts linear, ½ inch spreading, thickly covered with glands; inner spatulate ⅛ to ⅙ inch: floral scales boat-shaped pubescent above. Florets yellow: rays broad three-lobed. Anther lobes acute. Styler arms flattened, rather broad. Achenes black, smooth. t. 168. Wight Ic. t. 1103.

Belongs properly to lower levels, but occurs occasionally on the downs. *Fyson* 67. *Bourne* 526.

Gen. Dist. Throughout India and all warm countries.

BIDENS.

F.B.I. 78 LX.

Bur-marigold.

Herbs with opposite leaves and flower-heads of the HELIANTHOIDEÆ (p. 209) distinguished from all others by the achenes having at the top two to four *barbed* spines.

Species 50, chiefly in America.

Bidens pilosa Linn.; F.B.I. iii 309, LX 3; common Bur-marigold. Stem erect four-angled, glabrous or nearly so, leaves opposite pinnately three-foliate or three-fid; terminal leaflet or segment sharply serrate except perhaps the acuminate apex, 2 to ¾ inch; lateral 1 to

$\frac{1}{2}$ inch shortly petioled. Flowering portion of plant cymosely forked; ultimate peduncles 1 to $2\frac{1}{2}$ inches stout: bracts $\frac{1}{2}$ inch. Involucral bracts with broad scarious margins. Ray florets yellow or white. Achenes black narrow, angled, exceeding the involucre and surmounted by two awns with many downward pointing barbs. t. 169.

A wayside weed. Nilgiris: Ootacamund and lower levels. Pulneys: Kodaikanal down to the plains. *Fyson* 580, 700.* *Bourne* 1565.

Gen. Dist. Throughout India and in all warm countries. *Fr.* Bident, *Ger.* Zweizahu.

***Bidens humilis*, H. B. & K.; LX 4;** trailing Bur-mari-gold. Stems weak, spreading. Leaves finely pinnately dissected into narrow segments or leaflets. Rays few spreading, $\frac{1}{2}$ inch, conspicuous. Achenes black with two very short, barbed awns. t. 170.

Road-sides in Ootacamund common, conspicuous in December. Not collected on Pulneys.

An introduction from the highlands of tropical America. *Fyson* 2039, 3034. *Bourne* 4594*.

GALINSOGA.

F.B.I. 78 LXII.*

Annual herbs with opposite leaves and small flower-heads of the HELIANTHOIDEÆ (p. 209), with yellow rays: all the florets fertile: floral scales boat-shaped: achenes angled or compressed, surmounted by a few scarious entire awned or fimbriate scales.

Species 5, in tropical America.

***Galinsoga parviflora* Cav.; F.B.I. iii 311, LXII* 1.** A small weed with opposite three-nerved leaves and rather few flower-heads on slender stalks of unequal length.

Annual 6 to 20 inches, nearly glabrous, except in the youngest parts, cymosely branched upwards. Leaves shortly stalked, ovate, acute or acuminate, sub-serrate, three-nerved from the base; uppermost leaves narrow,

Peduncles slender $\frac{1}{2}$ to 1 inch, often in terminal unequal pairs. Heads $\frac{1}{4}$ inch: bracts broad, smooth, three or more nerved. Achenes wedge-shaped with a ring of about ten oblanceolate feathery scales.

Nilgiris: as a weed at Ootacamund. Not previously recorded from South India and no specimen from here at Kew. *Fyson* 2849.

Gen. Dist. A weed from America now distributed in South Africa, New Zealand, Himalayas and in Great Britain.

COTULA.

F.B.I. LXIII.

Small herbs with alternate pinnately cut leaves, and small, long stalked, unrayed flower-heads, characterised by the achenes being stalked.

Species 40 in temperate and tropical climates.

Cotula australis Hook. f.; LXIII 4. Stem and branches $2\frac{1}{2}$ to 4 inches. Leaves $\frac{1}{4}$ inch pinnatisect into linear segments. Heads $\frac{1}{6}$ inch, on leafless continuation of the branches: outer involucral bracts oblong obtuse, one-nerved, with broad scarious margin: receptacle naked but for the persistent cylindrical scales of the outer florets. Achenes obovate, winged, tubercled, notched at the top.

Weed. A native of Australia and New Zealand, probably introduced with garden seed. *Fyson* 3035. *Bourne* 26.

ARTEMESIA.

F.B.I. 78 LXXII.

Mugwort, Southernwood, Wormwood, Absinth.

Herbs or at times shrubby plants, usually highly aromatic, with alternate leaves, usually much divided and often white underneath, and small round flower-heads set in slender spikes, which form large leafy panicles. Involucral bracts round, scarious-margined. Receptacle without scales. No ray-florets. Achenes minute and without pappus.

Species about 200 in the cooler climates of almost the whole northern hemisphere, a few in South America and the Sandwich islands. In Europe several species, Mugwort, Wormwood, Absinth. *Ger.* Beifuss, Wermuth, *Fr.* Armoise. Southernwood and Tarragon are cultivated in English Gardens.

Leaves white underneath *A. vulgaris*.

Leaves green underneath *A. parviflora*.

***Artemesia parviflora* Roxb.; F.B.I. iii 322, LXXII 5.**
Stem 2 to 5 feet grooved. Lower leaves wedge-shaped, coarsely toothed along the broad further margin: upper pinnatifid with narrow segments, sparingly hirsute: all with a pair of narrow stipular-like segments at the base. Panicle 12 inches high by 4 inches wide. Heads $\frac{1}{8}$ inch. Involucral bracts broad, obtuse. Florets few, some with large anthers, but only an aborted ovary and undivided style. Achenes ellipsoid, smooth.

Nilgiri and Pulney downs, common. Flowers colder months. *Fyson* 1082, 2134.* *Bourne* 73.

Gen. Dist. Mountains of India (not Ceylon)

***Artemesia vulgaris* Linn.; F.B.I. iii 325, LXXII 14.**
Mugwort. Tall aromatic herb or shrub growing to 5 or 6 feet. Leaves pinnatisect, white tomentose below, aromatic. All florets fertile.

Nilgiris: on the downs in dense patches, possibly the sites of former Toda-munds. Pulneys; apparently truly wild on the downs. Also near villages, e.g., Vilpatti. *Fyson* 2135, 2496, 2078. *Bourne* 1556.

Gen. Dist. Wild on the Bombay Ghats and mountains of India and temperate regions of the northern hemisphere. Also cultivated.

Formerly much used in Europe, as elsewhere, for flavouring dishes and drinks, whence the English Mugwort, Mugwood, Muggert or Mugger; *Ger.* Beifuss, Biboess; *Fr.* Armoise.

GYNURA.

F.B.I. LXXVI.

Succulent herbs with alternate coarsely toothed or entire leaves and unrayed flower-heads with involucre of the *SENECIO* type (p. 242) and a few small bracts below,

but distinguished from **SENECIO** and also from **NOTONIA** and **EMILIA** by the styler arms being hairy, slender, and tapering to a fine point.

Species about 20 in the warm parts of Asia, Africa and Australia.

Gynura nitida DC. ; *Wight's Herb. Prop.* ; *F.B.I.* iii 333, LXXVI 1. Herb, 2 to 5 feet, glabrous except near the flower-heads. Leaves mostly towards the base of the stem or branches, obovate or oblanceolate, coarsely toothed or serrate, acute or obtuse, narrowed at the base, or very broad and almost auricled. Heads few or many, in terminal simple or compound corymbs, often umbellate : involucral bracts purple, narrow, glabrous. Florets yellow, achenes papillose between the five ribs. *Wight Ic.* t. 1121.

Nilgiris and Pulneys. Flowers in August and September. *Fyson* 479. *Bourne*, 320.

EMILIA.

F.B.I. LXXVII.

Herbs with alternate leaves and small solitary purple flower-heads, with involucral bracts of the **SENECIO** type and similar to **GYNURA** but without small extra bracts below the flower-head, and styler arms truncate. Pappus hairs long, copious.

Species 4 or 5 in India and tropical Africa.

Emilia sonchifolia *Wight* ; *Herb. Prop.* 1486 ! ; *F.B.I.* iii 336, as of DC., LXXVII 1. A herb, when young with leaves mostly near the ground and short flowering stems ; when older, 2 to 3 feet, erect or decumbent, leafy except near the flowers. Radical leaves pinnatifid or lyrate with end lobe largest : upper leaves oblong, stem-clasping, serrate : all more or less scabrid. Heads on long slender stalks, purple. Styler arms truncate, achenes five-ribbed, hairy on the ribs and papillose between them. *Wight Ic.* t. 1123.

Somewhat variable, F.B.I. gives three varieties which however grade into each other.

Very common on the downs. Pulneys and Nilgiris after the summer rains. *Fyson* 3036, 2988. *Bourne* 520, 1116, 1568,* 1113, 1114, 2704.

Gen. Dist. Throughout India, Asia and Africa.

Emilia zeylanica *C. B. Clarke*; *F.B.I.* iii 336, LXXVII 4. Stems or branches to 2 feet, glabrous, slender. Leaves entire, narrow, oblong or oblanceolate; upper ones with auricled base. Flower-heads few: bracts $\frac{1}{3}$ by $\frac{1}{16}$ inch, oblong acute. Styler arms with enlarged tips (cones). Achenes scabrid. *Wight* Ic. t. 1123.

Pulneys: on the downs. *Fyson* 285. *Bourne* 319, 690, 1115, 2705, 2706.

Previously known only from Ceylon.

I have been unable to find Clarke's type sheet, but have seen many others named by him at Kew. My achenes are smooth, but perhaps only so because young. The styler arms are definitely as Clarke describes, and I have no doubt that my Pulney plant is the same species as his from Ceylon, in which case Bourne's plants are also.

NOTONIA.

F.B.I. LXXVIII.

Succulent herbs or undershrubs with long stalked unrayed flower-heads having involucrel bracts of the *SENECIO* type (p. 242), and in general similar to *GYNURA* but the styler arms oblong.

Species 4 or 5 all Indian.

Notonia walkeri *C. B. Clarke*; *F.B.I.* iii 337, LXXVIII 3. A tall herb or shrub, glabrous. Leaves 4 to 8 inches, elliptic, acute at both ends, serrate, with stalk dilated at the base. Corymbs terminating leafless continuations of the stem: the ultimate peduncles with several small bracts below the flower-heads: bracts linear $\frac{1}{2}$ to $\frac{3}{4}$ inch. Florets all tubular. Achenes five-ribbed, hairy on the ribs. *Wight* Ic. t. 1122 as *Gynura*.

Nilgiris: Ootacamund on Club hill. Pulneys. Flowers in winter months. *Fyson* 1123. *Bourne* 4822.

· **SENECIO.**

F.B.I. LXXIX.

Ragwort.

Herbs or shrubs, erect or climbing, with alternate leaves and yellow-rayed flower-heads characterised by the involucrel bracts narrow but not attenuate, usually all equal in one circle only or with a few outer smaller and filiform; anther bases rounded; and stylar arms truncate, recurved. Achenes five to ten-ribbed, with copious pappus.

Species about 900 in temperate climates (in the tropics on mountains).

In Europe are several species Groundsel, Ragwort, *Ger.* Kreuzkraut, Kreuzwurz; *Fr.* Senecon, Jacobée.

Senecio zeylanicus DC.; *F.B.I.* iii 340, LXXIX 8; Grassy Ragwort. Distinguished by its very narrow, entire, almost grass-like, leaves.

Stem puberous-pubescent, 1 to 3 feet, slender. Lower leaves 4 to 6 by $\frac{1}{8}$ to $\frac{1}{3}$ inch, one-nerved, occasionally toothed; upper narrower. Corymbs 6 inches broad, with slender bracts at the forkings. Heads $\frac{5}{8}$ inch: bracts $\frac{1}{4}$ inch, pubescent, suddenly ending in long points. Achenes black, strongly ribbed, minutely scabrid. Pappus white.

Pulneys: on the downs. *Fyson* 3037. *Journal* 1566, 1570.

Gen. Dist. Mountains of Travancore and Ceylon.

Senecio nilgheryanus Wight; *Herb. Prop.* 14821; *F.B.I.* iii 341 as of DC., LXXIX 9; Nilgiri Ragwort. Distinguished by its oblong or oblanceolate, very distantly toothed leaves.

Stem shrubby below, nearly glabrous or cottony, ribbed or angled, leafy. Leaves 3 to 5 inches, oblong oblanceolate, from a narrow auricled base, scabrid above, hirsute-tomentose below, acute, distantly toothed, one-nerved. Heads 1 inch, not numerous, in open

corymbs: bracts with broad scabrid nerve. Rays spreading. Pappus white. Wight Ic. t. 1132.

Pulney and Nilgiri downs, but not at the higher levels. Flowers in summer. Not recorded elsewhere. *Fyson* 271. *Bourne* 1117 (Vilpatti).

Senecio lavandulæfolius Wight, *Herb. Prop.* 14811; *F.B.I.* iii 343 as of *DC.*, LXXIX 17. A small erect single stemmed herb distinguished by its closely set erect narrow leaves, the whole leafy part being of a spindle shape.

Stem unbranched, or branched towards the top, 6 to 18 inches erect. Leaves 1 by $\frac{1}{8}$ inch, densely imbricate, oblong, acute, erect from a broad base, one-nerved, villous above, tomentose underneath; margin slightly recurved: upper and lower leaves shorter. Corymb terminal-stalked above the uppermost leaf. Bracts many imbricate, pubescent. Pappus white. t. 171. Wight Ic. t. 1133.

On the open grass downs of both plateaus. Nilgiris: flowering December. Pulneys: flowering September. *Fyson* 2075, 2035. *Bourne* 1571.

In figure 171: *a.* central floret with stamens but no style; *b.* disc floret with stamens and style; *c.* ray floret with style only; *d.* involucre after flowering with inner bracts spread showing receptacle pitted; *e.* ripened achene of hermaphrodite floret *b*; *f.* unfertilised ovary of *a* or *c.* [*E.T.B.*]

Senecio saxatilis Wall.; *F.B.I.* iii 344, LXXIX 20; Swamp Ragwort. Stem at the base, or perennial root-stock, decumbent, sometimes long and creeping, not as a rule branching below the flowering part. Leaves oblanceolate, serrate, acute, with auricled base; the lower about $2\frac{1}{2}$ by $\frac{1}{2}$ inch, the upper smaller. Branches of the corymb slender, with linear bracts of $\frac{1}{8}$ to $\frac{1}{4}$ inch, not only at the forkings but also scattered on the branches and peduncles. Heads $\frac{3}{4}$ inch. Involucral bracts about sixteen. Rays $\frac{1}{4}$ by $\frac{1}{12}$ inch, yellow.

Achenes slender as long as or longer than the scabrid pappus. Wight Ic. t. 1124 (*Doronicum wightii*).

Nilgiris: in swamps. *Bourne* 5206, 5233.

Gen. Dist. Also Khasi.

I have not myself collected this species. *Bourne's* plants from which the above description is taken do not agree absolutely with the description in *F.B.I.* where the peduncles are given as without bracts. Wight's figure shows them so, but in the letterpress the "pedicels" are "bracteolate."

***Senecio polycephalus* Clarke; *F.B.I.* iii 344, LXXIX 22.** Stem at base creeping or a slender rhizome, above branched or not below the flowering part. Whole plant covered with scattered hairs. Leaves mostly near the base; these about 2 by 1 inch, elliptic regularly crenate-serrate, with rather thickened margin and hairs from bulbous bases: upper leaves oblong, $1\frac{1}{2}$ by $\frac{1}{4}$ inch with auricled base, diminishing upwards into bracts. Heads few, 1 inch across: branches of corymb, with several linear bracts, especially near the heads. Involucral bracts ten to fifteen, $\frac{1}{5}$ inch long, linear oblong acuminate, glabrous or pubescent. Rays eight to ten, very broadly oblong, equal to the involucral bracts. Achenes slender, $\frac{1}{6}$ inch, nearly as long as to the red pappus. Wight Ic. t. 1124.

Nilgiris: on the downs; flowering September. *Bourne* 5202, 4664.

***Senecio araneosus* DC.; *F.B.I.* iii 351, LXXIX 44.** Similar to *S. corymbosus* but differing in the leaves not being tomentose underneath.

Stem slender, finely grooved. Leaves stalked, cordate, with small distant teeth, glabrous or cottony. Flower-heads in axillary or terminal rounded panicles: involucral bracts about eight, $\frac{3}{16}$ inch long, linear with thick middle band and paler margins. Achenes $\frac{1}{8}$ to $\frac{1}{6}$ inch: pappus $\frac{1}{4}$ to $\frac{3}{8}$ inch. Wight Ic. t. 1131,

In sholas on both plateaus, flowering during the early months of the year. Nilgiris: Ootacamund to Coonoor. Pulneys: near Kodaikanal and down to Shembaganur. *Fyson* 2550. *Bourne* 1572.

***Senecio corymbosus* Wall., Cat. 3121 !; F.B.I. iii 351, LXXIX 45.** A climber similar to *S. araneosus* but leaves white-tomentose underneath. Stem zigzag, slender, ribbed but not angled, cottony. No stipules. Leaf-stalks 1 inch: blade 1 to 2 inches, ovate to circular, acute, deeply cordate: margin with a few small teeth: underside covered with dense white tomentum; upperside glabrous except for an easily removed cotton. Flower-heads numerous, in terminal or axillary peduncled rounded panicles with very tomentose branches: bracts $\frac{1}{3}$ to $\frac{1}{2}$ inch, lanceolate ovate or leafy. Involucral bracts eight, $\frac{1}{4}$ inch, glabrescent. Achenes glabrous. *Wight* Ic. t. 1130.

Nilgiris: on the downs near Ootacamund and down to Pykara. Flowers from December to March. Pulneys: Kodaikanal, etc. *Fyson* 1544, 1064, 1049, 2210. *Bourne*. Collected by Rangachari at Pykara, (?) 1118.

Bourne 1118 leads one to suspect that *S. corymbosus* and *S. araneosus* are one and the same.

***Senecio wightianus* DC.; Herb. Wight Prop. 1480!,** including *S. intermedius* *Wight*; *F.B.I. under S. scandens* *Don*, iii 352; LXXIX 47.** A slender weak-stemmed plant climbing or growing gregariously in clumps or bushes 3 to 4 feet high and more wide, with stalked hastate toothed leaves, not white below, and terminal corymbs of small flower-heads.

Stem slender, strongly (about ten) ribbed. Stipules semi-lunar, $\frac{1}{6}$ to $\frac{1}{4}$ inch. Leaves simple or of three leaflets: stalk $\frac{1}{3}$ to $\frac{1}{2}$ inch. Lateral leaflets if present opposite, $\frac{1}{2}$ by $\frac{1}{4}$ inch, obovate deltoid or oblanceolate; terminal leaflet triangular or hastate, $1\frac{1}{2}$ to 2 by $\frac{1}{2}$ to 1 inch (at base), sharply and irregularly dentate, glabrous

on the upper side, pubescent on the under. Corymbs on axillary branches, ten to twenty-flowered: bracts $\frac{1}{8}$ inch linear. Heads $\frac{1}{4}$ inch: involucral bracts slender. Achenes $\frac{1}{16}$ inch. t. 172. Wight Ic. tt. 1135 and 1136.

Nilgiris and Pulneys: on the downs, flowering from September to December. *Fyson* 2046, 301. *Bourne* 2118.

Gen Dist Also Ceylon. Wight Kew Dist. 1649, 1650, Hohenacker 1353, Gardner.

S scandens *Don.*, with which this is united by Hooker in *F.B.I.*, is a Nepal plant with larger stipules and larger flower-heads, and appears to me different. Clarke however in his *Compositæ of India*, with MS. revision, united *S. candicans* *DC.* also under *S. scandens* *Don.* Whether these are all to be considered one species or two or three must largely be a matter of individual opinion, but the name *scandens* for an Indian *SENECIO* cannot stand since Thunbergh had already given it to a South African species, as *Cacalia scandens* *Thunb.* in his *Plantarum Capensium*, first edition, 1794. *Don's Prodrômus Nepalensis* was published in 1825.

Senecio candicans *DC.*, *Wall. Cat.* 3123!; *F.B.I.* iii 352, LXXIX 48. A climber: whole plant whitish with close or loose tomentum. Stems zigzag, five-angled and ribbed. Stipules $\frac{1}{4}$ inch, prominent, roundish or ear-shaped. Leaf-stalk $\frac{1}{4}$ inch: blade $1\frac{1}{4}$ to 2 by $\frac{1}{2}$ to 1 inch, hastate or triangular with cordate base, acuminate, serrate. Corymbs terminal. Bracts $\frac{1}{4}$ inch whitish. Ray florets few. Achenes pubescent. Wight Ic. t. 1134.

Nilgiris: near Ootacamund and down to lower levels, common, flowering December. Pulneys: Kodaikanal, etc., flowering July. *Fyson* 1044, 2013, 2224. *Bourne* "Coonoor."

CNICUS. *F.B.I.* 78 LXXXVII.

Thistle.

Erect herbs with spiny and spine-toothed leaves often decurrent down the stem, and spiny involucral bracts. Florets all tubular and similar. Anther cells with slender tails. Achenes with feathery pappus.

Species about 150 in all north temperate climates.

Cnicus wallichii DC.; *F.B.I.* iii 363, LXXXVII 7; common Indian Thistle. Stem 3 to 5 feet, ribbed, cottony. Leaves sessile stem-clasping; lower deeply pinnatisect, upper sinuate-pinnatifid: the segments irregularly lobed and toothed, and margin all round armed with numerous long slender spines. Heads terminal on short axillary leafy branches, forming a terminal corymbose panicle. Outer involucre bracts very spiny, inner dilated just below the tip and incurved there. Florets purple. Pappus white, feathery. Wight Ic. tt. II 37-8.

On the open downs. Pulneys. Flowers in June. Nilgiris. *Fyson* 414, 3038. *Bourne* 524.

Gen. Dist. Himalayas of Sikkim, Nepal and Bhotan.

PICRIS.

F.B.I. 78 CVII.

Oxtongue.

Herbs with hispid stem, alternate or radical leaves, and few, long stalked, yellow flower-heads of the *CICHORIACEÆ* type (p. 210) (all florets ligulate and similar), and characterised by the involucre composed of a set of narrow scarious inner bracts in one circle, with several shorter outer bracts; achenes with five to ten rough ribs; and pappus hairs feathery and copious.

Species about 24, Europe, North Africa, northern Asia; and one cosmopolitan.

Picris hieracioides Linn.; *F.B.I.* iii 392, CVII; Hawkweed Oxtongue. Stem rough with stiff hairs. Leaves oblong, stem-clasping, 3 to 8 by 1 to 1½ inches, sinuate-toothed, very scabrid on the margin and midrib underneath. Heads often in pairs on a long common peduncle, with a few linear bracts on the pedicels. Inner involucre bracts all equal, outer unequal and much shorter; all scabrid with a single or double row of stiff

black hairs down the middle. Florets orange-yellow. Achenes $\frac{1}{6}$ inch, pointed at each end, slightly curved, ribbed and cross-ribbed: pappus white, feathery. t. 173. Wight Ic. t. 1143. Ill. to Bentham's Brit. Flora by Fitch and Smith No. 581.

On the open downs. Pulneys and Nilgiris. Flowers from May to January. *Fyson* 367, 2219. *Bourne* 1573.

Gen. Dist. Temperate climates of the Old World.

CREPIS.

F.B.I. CVIII.

Hawksbeard.

Herbs with the leaves mostly from near the ground, or if on the stem alternate and clasping the axis with ear-like bases. Florets yellow, all strap-shaped, five-toothed. Involucres narrow, cylindrical or enlarged at the base, of two series of bracts; the outer short, the inner much longer and after the flowering is over with thickened and hardened midrib: receptacle naked. Anthers pointed at the base. Stylar arms slender. Achenes ten to thirty-ribbed (not compressed as in *SONCHUS* and *LACTUCA*), and contracted just below the summit, crowned by a pappus of very white, fine hairs.

As defined in *Gen. Plant.*, species about 130 scattered over the northern hemisphere, mostly of the Old World; in America fewer, and very few in the tropics and south of the Line.

Stem up to 18 inches, much branched below the flowers; heads $\frac{1}{4}$ inch or less; achenes with many ribs . . . *C. japonica*.
Flowering stem less than a foot high, not branched; heads 1 inch; achenes with six thick ribs *C. acaulis*.

Crepis japonica Benth.; F.B.I. III 395, CVIII 6; Japanese Hawksbeard. Leaves nearly all near the ground, sinuate-pinnatifid or lyrate, with minute spiny teeth. Flowering stems several, erect, nearly leafless, 1 to 2 feet, slender, branched upwards so that the heads are in a loose panicle. Involucres $\frac{1}{8}$ inch across: bracts

$\frac{1}{6}$ inch long, linear. Achenes $\frac{1}{10}$ inch, ellipsoid, strongly ribbed, brown. Wight Ic. t. 1147.

In shady places, e.g., woods. Pulneys: in and near Kodai-kanal, flowering June. Nilgiris: commoner at lower levels. *Fyson* 312. *Bourne* 264, 1574.

Gen. Dist. South-east Asia on mountains from Afghanistan to Ceylon, eastwards through the Malay Peninsula to China and Japan, and westwards to Mauritius.

***Crepis acaulis* Hooker f.; F.B.I. iii 396, CVIII 8; Little Hawkweed.** A small herb common in the grass of the open downs, with solitary yellow flower-heads which appear after the first showers.

Rootstock perennial, as thick as a lead pencil. Leaves mostly radical, 2 to 4 inches, oblanceolate, with sheathing base; the margin with or without shallow bays and also set with small close, backward-pointing red teeth; blotched often with purple on both sides, quite glabrous. Flowering stem shorter or longer than the leaves, sparingly branched. Heads few, 1 to $1\frac{1}{4}$ inches, broad. Bracts of the involucre few, with thin purplish margins and thickened midrib; the three outer ones about half as long as the five or six inner. Florets seven or eight, all strap-shaped, five-toothed, their backs purplish in the middle where not overlapped; the upper side pale yellow. Corolla tube hairy at the mouth. Anthers fully exerted above the mouth, sagittate. Branches of the style slender, $\frac{1}{2}$ inch, hairy all along the outer side. Pappus very white, achenes contracted just below the top. t. 174. Wight Sp. Nilg. t. 118; Ic. t. 1145.

On the open grass land. Nilgiris: common at Pykara (6,700 feet) and above. *Fyson*. *Bourne* 195, 409.

The flowers open about 10 a.m., and close before 4 o'clock. I adopt the name Hawkweed rather than Hawksbeard for this species, though the true Hawkweeds (*Hieracium*) are distinguished by the bracts of the involucre remaining unaltered after flowering, the achenes not being contracted below the pappus, and in other details, because this species is much more like in habit and general appearance the Mouseear and Alpine Hawkweeds of England than to any British species of *Crepis*.

HYPOCHÆRIS.

F.B.I. 78 CXI. *

Catsear.

Annual (or perennial) herbs with leaves all near the ground and heads borne singly on nearly leafless simple or branched flower-stems (scapes). Involucral bracts in two or three rows, the outer short, the inner longer. Florets all ligulate and similar, yellow. Receptacle with scales between them. Achenes slender with ten ribs and also cross-wrinkles. Pappus hairs feathery.

Species about 3 in temperate climates.

Hypochæris glabra Linn.; F.B.I. iii 401, CXI 1. Leaves sessile, obovate or oblanceolate, sinuate toothed. Flower stems about a foot, simple or occasionally forked thickened at the top and with a few small bracts. Heads $\frac{3}{8}$ inch. Outer bracts of involucre short; inner lengthening in fruit to $\frac{5}{8}$ by $\frac{1}{8}$ inch. Achenes dark brown finely ribbed and wrinkled; those of the outer florets $\frac{1}{6}$ inch truncate, those of the inner narrowed to a slender beak bearing the pappus.

A weed on road-sides in Ootacamund, flowering December. *Fyson* 2034. Native of Europe.

TARAXACUM.

F.B.I. 78 CXII.

Dandelion.

Herbs with milky juice, perennial rootstock, and leaves all radical, and characterised by the flower-heads on tall leafless stalks (scapes) rising straight from the rootstock; the involucre of an inner single circle of erect bracts which do not change after flowering with several outer often recurved bracts; and the achenes extended upwards in a long beak bearing the pappus hairs which spread out horizontally like a flat umbrella.

Florets all similar and fertile, ligulate, with five teeth anther-cells with long tails: stylar arms slender.

Species about 10, in temperate and cold regions.

***Taraxacum officinale* Linn. ; F.B.I. iii 401, CXII 1 ;** common Dandelion. Rootstock strong, vertical. Leaves all radical pinnatisect, with backward sloping segments; margins with small spine-teeth. Heads solitary on hollow scapes of about 6 inches: inner bracts erect $\frac{3}{4}$ inch. Florets yellow. Achenes $\frac{1}{3}$ inch, egg-shaped, the upper and broader end armed with teeth and prolonged into a beak $\frac{1}{5}$ inch long. Pappus hairs feathery.

As a weed. Kodaikanal. *Fyson. Bourne 701.*

Hooker in F.B.I. observes that it is remarkable that this plant, so common in the Himalayas, should not be found on the Khasi and Nilgiri mountains, even as a garden-escape. I have seen it only as a weed.

LACTUCA.

F.B.I. 78 CXIV.

Herbs with milky juice and narrow heads of yellow blue or white ligulate florets, with thin involucre bracts, no scales between the florets, and achenes narrowed upwards into a beak which ends in a small disc carrying the very soft white pappus of simple hairs.

Species about 60 in the north temperate regions.

***Lactuca hastata* D.C. ; F.B.I. iii 407, CXIV 14.** Stem tall, 2 to 7 feet, glabrous or roughened or sticky. Leaves 4 to 12 inches, variable in shape; usually with a narrow-stalk part extended in occasional lobes and widened to clasp the stem at its base, and a broad terminal heart-shaped part, with small sinuate-teeth. Heads several in irregular racemes or branches at the end of the stem, in the axils of narrow bracts $\frac{1}{6}$ inch wide and 1 inch or more long. Involucre of several rows of bracts about $\frac{1}{2}$ inch. Florets bluish-purple. Achenes

$\frac{1}{4}$ inch including the beak, quite flat, irregularly ribbed, suddenly contracted into a brown cleft tip in which the white beak is situated. Pappus $\frac{1}{4}$ inch dirty white with an outer ring of bristles.

Nilgiris : Forester's hut near Ootacamund. *Bourne* 5218.

Gen. Dist. Also temperate Himalayas and Khasi hills.

SONCHUS.

F.B.I. 78 CXVII.

Sowthistle.

Leafy herbs with milky juice and radical, or alternate and then stem-clasping leaves, and irregular umbels or corymbs of yellow flower-heads, often broadest at the base, of the *CICHORIACEÆ* type (p. 210) (all florets ligulate and similar), on a flat receptacle, and characterised by the ribbed obovoid or ellipsoid compressed achenes, without beaks, and the long slender pappus hairs united at the base and falling off together.

Species 24 in the north temperate regions and central Asia ; a few spread as weeds all over the world.

Sonchus arvensis *Linn.* ; *F.B.I.* iii 414, CXVII 2 ; Corn Sowthistle. Stem $1\frac{1}{2}$ to 2 feet with perennial rootstock. Radical leaves deeply pinnatisect, the terminal and each pair of lateral leaflets forming broad triangles with almost horizontal base ; margin finely sinuate-spine-toothed : upper leaves lanceolate, broadest at the deeply cordate stem-clasping base. Flower-heads 1 inch, in an irregular umbel : involucral bracts glabrous $\frac{1}{2}$ inch. Achenes dark brown, ribbed and cross-striated, blunt above, tapering below ; pappus silky. Wight *Ic. t.* 1142.

Ootacamund as a weed. Flowers in cold months. Pulneys : at lower levels. Poombari (*Bourne*).

Gen. Dist. Wild and a weed of cultivation in all temperate and many tropical countries.

CAMPANULACEÆ.

Herbs with alternate leaves. Flowers monopetalous with an inferior ovary, typically of three cells; rather long persistent sepals; stamens attached at the base to the corolla; and very numerous small seeds with erect embryo in endosperm.

Species about 1,000, all over the world.

Tribe I: LOBELIÆ—Corolla irregular, two-lipped, and split down the back to the base: anthers united but filaments free (as in COMPOSITÆ).

Fruit a capsule: tall herbs with dense spike of flowers; or small herbs LOBELIA.

Tribe II: CAMPANULÆ—Corolla regular: anthers not connected.

Capsule opening inside the calyx-teeth: stem very slender. (Hair-bell) WAHLENBERGIA.

Capsule opening by slits at the side, below and between the calyx-teeth: stem erect or spreading . . . CAMPANULA.

LOBELIA.

F.B.I. II.

Herbs, tall or quite low, with alternate usually toothed leaves. Flowers solitary in the axils of leaves or of bracts, and then often in a dense terminal spike. Corolla two-lipped; upper lip split down the back; lower three-lobed spreading. Stamens five, connected above into a tube: anthers connate, the two upper (dorsal) tipped with bristles, the three lower naked. Ovary inferior, three-celled, surmounted by three long sepals: style single, with bifid stigma. Fruit a capsule opening in two valves between the calyx-teeth.

Species 200, in temperate and sub-tropical regions.

Lobelia trigona Roxb.; F.B.I. iii 423, II 1. A small delicate herb similar to the common blue *Lobelia* of gardens.

Stem 5 to 12 inches. Leaves $\frac{1}{4}$ to $\frac{3}{4}$ inch, broadly ovate, crenate-serrate, very shortly stalked. Flowers on

slender axillary pedicels of 1 inch. Calyx-tube $\frac{1}{8}$ inch ; teeth slightly longer, linear. Corolla twice as long, blue, with unequal lobes. Anthers all tipped with a minute fringe of hairs. Capsule $\frac{1}{6}$ to $\frac{1}{4}$ inch, ellipsoid.

Belongs properly to lower levels, e.g., Coonoor, Courtallum and Mysore, but occurs on the Nilgiri plateau at Pykara, 6,700 feet, in marshy ground, *Fyson* 2895. Pulneys : (below Kodaikanal), *Bourne* 664.

Gen. Dist. South India from sea level upwards to 6,000 feet and over, Assam, Bengal, Ceylon, Burma.

Lobelia excelsa *Lesch.* ; *F.B.I.* iii 427, II 15. Tall coarse herbs, stem usually simple. Leaves oblanceolate obovate or elliptic, very large at the base, smaller above, soft, finely toothed. Flowers in a dense purplish brown spike, 12 inches by $1\frac{1}{2}$ to 3 inches. Calyx-tube campanulate, $\frac{1}{6}$ inch, tomentose ; sepals $\frac{5}{8}$ inch, narrow acute. Corolla about twice as long, split down the back, so that it falls down exposing the stamens. Filaments twice as long as the sepals : anthers $\frac{3}{10}$ inch, oblong, glabrous. Fruit globular, enclosed in the calyx-tube. Wight Ic. t. II 72.

At high levels round sholas, etc. Nilgiris : Ootacamund. Pulneys : Kodaikanal and above. *Fyson* 299, 411, 1891, 1938. *Bourne* 105.

Gen. Dist. Mountains of South India.

At lower levels its place is taken by *L. nicotianæfolia* *Heyne* ; *F.B.I.* iii 427, II 14 ; with loosely-packed, branched spikes and larger, white, flowers ; *Fyson* 1591, 514 ; *Bourne* 164 : and by a variety *tricantha* of that species, which has a slendered, more branched and leafy spike ; *Fyson* 409.

WAHLENBERGIA.

F.B.I. IV.

Flowers of the CAMPANULA type, i.e., the corolla quite regular, bell-shaped with five lobes, and the anthers free ; but differing in the capsule opening at the top, inside the sepals.

Species 100 mostly in the southern hemisphere, e.g., south and tropical Africa, Madagascar, tropical and eastern Asia, Australia, New Zealand, western Europe.

Wahlenbergia gracilis DC.; *F.B.I.* iii 429, IV 1; Hairbell.

Stems several from a horizontal perennial rootstock, flexible, 2 to 12 inches. Leaves $\frac{1}{4}$ to 1 inch, mostly narrow, linear or lanceolate to obovate-oblong, distantly and minutely toothed, strongly one-nerved. Flower-stalks terminal, 1 to 6 inches, naked or with one or more bracts and aborted buds. Receptacle (calyx-tube) $\frac{1}{12}$ inch, campanulate; sepals longer, acute, glabrous. Corolla bell-shaped, about $\frac{1}{2}$ inch, mauve-blue, divided nearly one-third way down into five broad lobes. Stigma three-lobed. Capsule $\frac{1}{4}$ inch, egg-shaped, tapering to the stalk, opening by three valves inside the sepals. t. 175. Wight Ic. t. 1175, Sp. Nilg. 124.

In the grass of the open downs, very common, flowering after the first April showers. Pulneys: near and above Kodaikanal. Nilgiris: Ootacamund to Pykara and Coonoor. *Fyson* 412, 2891. *Bourne* 2, 59, 1264.*

The leaves vary in shape and hairiness.

CAMPANULA.

Herbs with perennial rootstock, rarely annuals. Corolla bell-shaped, lobed. Anthers not united. Capsule inferior crowned by the dried sepals and opening at the sides by slits between the ribs of the 'calyx-tube.'

Species about 200, mostly in the temperate regions of the northern hemisphere, also Mediterranean, Arabia, and tropical Africa and Asia (on mountains).

Campanula colorata Wall., *Cat.* 1287!; *F.B.I.* iii 440, XIII 5. Stem coarsely hairy $\frac{1}{12}$ to $\frac{1}{8}$ inch thick, solitary, or several from a perennial rootstock, erect or spreading. Leaves well separated, $\frac{1}{2}$ to $\frac{3}{4}$ inch, obovate

acute, crenate-serrate, hispid, especially on the under-side. Flowers terminating the main stem and on axillary branches, forming a broad irregular panicle. Calyx-tube $\frac{1}{8}$ inch; sepals as long triangular. Corolla twice as long, pale purple or grey-blue with darker markings, lobed about one-third. Anthers long, attached lightly at their bases. Stigma three-lobed. Calyx-tube in fruit $\frac{1}{4}$ inch, hemispheric with proportionately enlarged sepals. t. 176. Wight Sp. Nilg. t. 126; Ic. t. 1178.

In the grass of the open downs, flowering from May to August. Pulneys: 7,000 feet and above. Nilgiris: on the downs. *Fyson* 561. *Bourne* 305, 712, 805.*

The species was founded on a Himalayan plant. I find no difference between my Pulney and the Thibetan examples at Kew.

***Campanula alphonsii* Wall., Cat. 1296 !; F.B.I. iii 440, XIII 6.**

Stems slender, much tufted, weak and spreading. Leaves $\frac{1}{4}$ to $\frac{1}{2}$ inch, obovate, narrowed to the nearly sessile base, white below, with a few rounded teeth. Flowers mostly terminal, and a few pedicelled in the upper axils. Corolla bell-shaped $\frac{3}{4}$ to $\frac{1}{2}$ inch. Wight Sp. Nilg. t. 125, Ic. t. 1177.

On the downs, Pulneys and Nilgiris. *Bourne* 283, 1578.

Leaves similar in some respects to *C. colorata*, but more closely set and all facing upwards on the horizontal stems. The flowering part, too, not corymbosely branched. Not reported elsewhere.

***Campanula fulgens* Wall., Cat. 1283 !; F.B.I. iii 442, XIII 13.** Remarkable for the flowers being in groups at irregular intervals along the spike.

Stem erect, 1 to 3 feet, and about $\frac{1}{8}$ inch thick, ribbed, little, if at all, branched. Leaves crowded near the ground, distant higher up, 2 to $3\frac{1}{2}$ by $\frac{1}{2}$ to 1 inch, elliptic, narrowed at both ends, coarsely crenate-serrate, softly pubescent on the upper side, roughly hairy on the under. Spikes terminal. Flowers solitary or in bunches of two

or three at intervals of $\frac{1}{2}$ to 2 inches, subsessile ; the top flower opening first. Bracts linear $\frac{3}{8}$ inch. Calyx-tube conical $\frac{1}{8}$ inch ; sepals linear $\frac{3}{8}$ inch. Corolla blue $\frac{5}{8}$ inch, very deeply divided into five oblong rounded lobes. Anthers narrow, basifixed on slender filaments with broad bases. Ovary enclosed in the ten-ribbed calyx-tube, five-celled : placentas stalked from the inner angles and bearing numerous ovules. t. 177. Wight Sp. Nilg. t. 127 ; Ic. t. 1179 ; Ill. t. 136.

In the grass of the open downs, flowering from May to September. Pulneys : about and above Kodaikanal abundant. Nilgiris : Dodabetta and the downs. *Fyson* 453, 2138. *Bourne* 60, 113, 2707, 5207.

Gen. Dist. Nilgiri, Pulney and Coorg mountains up to 8,000 feet, Khasia, Nepal Sikkim (7,000 feet), Chembi valley, Burma (4,000 feet).

The opening of the topmost flower first and of the others later, in order from the base, is peculiar. It suggests a condensation in time of what one finds with some garden Campanulas, where after the first lot of flowers have withered, or perhaps before the top one which naturally opens last, a second crop appears in twos and threes at the nodes of the older, fallen, ones. If these latter (i.e., the first set) failed to appear at all, except the top one, we should get what we find in *C. fulgens*.

VACCINIACEÆ.

Shrubs and trees with alternate, exstipulate, toothed, leaves, and regular monopetalous flowers characterised by their great regularity, all parts being in fives ; five sepals, five corolla lobes, ten stamens, five cells to the ovary ; by the stamens being quite free of the corolla (unusual in *monopetalæ*) ; by the anthers opening by pores sometimes at the end of tubular extensions ; and by the inferior ovary (distinction from *ERICACEÆ*).

Species 350, in temperate and cold regions.

VACCINIUM.

F.B.I. 81 III.

Shrubs and trees with alternate ovate or lanceolate leaves, and small flowers in terminal or axillary racemes or bunches. Corolla (in Indian species) egg-shaped, with five small teeth. Anthers prolonged upwards in two

slender tubes with terminal slits or spurs. Fruit, a globose berry crowned by the calyx-teeth, and containing five or more seeds with firm smooth coat.

Species 100, in northern hemisphere and mountains of the tropics.

In Britain 4 species—Whortleberry, Bilberry, Cowberry, Cranberry, etc. *Fr.* Airelle. *Ger.* Blanebeere, Heidelbeere.

***Vaccinium leschenaultii* Wight ; F.B.I. iii 455, III 17.** A fair sized tree, with thick rough bark. Young parts pubescent, and young leaves pinkish. Leaves 2 to 3 inches by $\frac{3}{4}$ to 1 inch, alternate, erect and curving outwards, elliptic, acute at both ends, crenate, hard, shining ; stalks $\frac{1}{6}$ to $\frac{1}{4}$ inch : very similar to leaves of *Eurya japonica* except that the teeth are slightly larger and $\frac{1}{8}$ inch apart. Flowers in pubescent racemes, terminal and in the upper leaf-axils ; $\frac{1}{4}$ inch long, pink. Calyx $\frac{1}{8}$ inch, its five teeth triangular, $\frac{1}{20}$ to $\frac{1}{16}$ inch, ciliate. Corolla inflated, $\frac{1}{4}$ inch long, with five minute lobes curled back from the narrow mouth. Stamens ten : filaments $\frac{1}{30}$ inch, very hairy at the base : anthers as long, produced in two long white tails of $\frac{1}{8}$ inch. Ovary covered by a green, ten-lobed disk : style rising from its centre and jointed to it, white with small punctate stigma. Fruit a berry, $\frac{1}{4}$ to $\frac{1}{2}$ inch, pink. Seeds light brown $\frac{1}{30}$ inch finely wrinkled. t. 178. Wight Sp. Nilg. t. 128 ; Ic. t. 1188. Beddome Fl. Syl. S. Ind. t. CCVII.

Nilgiris : abundant on the plateau, near and in Ootacamund, flowering in winter months, fruiting in summer. Pulneys : in sholas at and above Kodaikanal, common. *Fyson* 517, 1345, 1825, 1920, 2014, 2712. *Bourne* 426, 1581, 2031.

Gen. Dist. South Indian mountains and Ceylon. Some Nilgiri specimens have nearly round leaves.

***Vaccinium nilgherrense* Wight ; F.B.I. iii 454, III 16,** with narrow leaves, pointed at each end, occurs at lower levels, e.g., Shembaganur, Pykara rapids,

ERICACEÆ.

F.B.I. 82.

Shrubs and trees with alternate or falsely whorled leaves, and perfectly regular flowers with five sepals ; a five-lobed monopetalous corolla ; ten stamens, with anther cells opening at the apex ; a five-celled superior ovary, and dry capsular fruit. (Distinguished from the VACCINIACEÆ in the last two respects.)

Species about 1,000, in all parts of the world, comprising plants of such different habit as *Rhododendron* and *Azalea*, developed chiefly on the mountains of western Asia, and *Erica* (Heather, Heath, Ling) a genus adapted by the small, often narrow and inrolled leaves to dry conditions and occurring exclusively in Europe and the Cape region of South Africa.

In Europe *Menziesia*, *Andromeda*, *Arbutus* (Strawberry tree) and *Arctostaphylos* (Bearberry), *Pyrola* (Winter green) and *Monotropa* (Birds-nest) belong to this or a very closely allied family.

Shrub, flowers 1/6 inch, egg-shaped, white, in racemes . . .

GAULTHERIA.

Tree, flower, 1 to 2 inches, bell-shaped, red, in bunches . . .

RHODODENDRON.

GAULTHERIA.

F.B.I. 82 I.

Shrubs with persistent alternate serrulate leaves and small flowers in racemes or solitary, with bract and bracteoles. Calyx egg-shaped, persistent as a fleshy coating round the fruit. Corolla long egg-shaped with five small recurved lobes. Stamens ten ; filaments broad, hairy ; anther cells produced upwards into tubes and horned behind (or in other flowers smaller and without these). Ovary of five cells with many ovules in each ; capsule loculicidal.

Species 90, mostly American.

Gaultheria fragrantissima Wallich ; F.B.I. iii 457, I 4 ; a shrub with stiffly erect twigs and leaves, smelling strongly of Oil of Wintergreen when crushed, and

axillary racemes of small snow-white, heather-shaped flowers or dark blue berries.

Young shoots smooth, often red, angular or compressed. Leaves very hard and stiff, erect or spreading; stalks thick, red; blade ovate, rounded at the base, crenate with small points from base to apex, and ending in a short blunt point: midrib stout; nerves impressed on the upper side; veins few and impressed on both sides: upper surface glossy; under light-coloured, dotted with black or brown glands. Calyx-teeth triangular, $\frac{1}{20}$ inch: bracteoles below it $\frac{1}{16}$ inch, ovate acute. Corolla egg-shaped, more or less five-angled, $\frac{1}{6}$ inch long and broad at its widest; mouth $\frac{1}{30}$ inch, with minute teeth: fragrant. Stamens ten; filaments broadest about the middle; anthers $\frac{1}{20}$ inch, brown, attached by their backs, flask-shaped and narrowed upwards, ending in four horns, and opening outwards by slits near the top. Ovary green, minutely pubescent, ten-lobed; style straight; stigma minute, in a terminal depression. Berry $\frac{1}{3}$ inch, dull cobalt blue with red stalk, impressed at the top with five radiating marks. Wight Sp. Nilg. t. 130; t. 1195.

Very common round sholas, in thickets and on the open downs. Pulneys: abundant near Kodaikanal, flowering before the summer: Nilgiris abundant; Ootacamund, Pykara, Coonoor; flowering early, and fruiting in May and June. *Fyson* 341, 1036, 1130. *Bourne* 95, 4589.

Gen. Dist. Himalayas from Nepal westwards; mountains of Burma, South India and Ceylon.

The fruit is more like an apple than an ordinary berry, for the seeds are not immersed in the flesh but enclosed in the cells of the ovary, separate from the flesh outside them.

Honey is secreted round the base of the ovary and held in by the ten little pockets between it and the stamens, and prevented from flowing out by the enlargements of the filaments. The anthers swing easily on their filaments, and their horns touch the inside of the corolla. They open outwards and any pollen that may be set free is caught by the hairs on the inside of the corolla, which are directed towards the base (i.e., upwards as the flower hangs) and thereby prevented from falling out. The honey can be obtained only by an insect clever enough to hang on the flower and probe upwards. The narrow entrance to the flower would cause the

proboscis to touch the style first and leave on the cup-shaped stigma any pollen it might bring. The proboscis would then curve round the ovary and against the corolla and so come into contact with the horns of a stamen and shake pollen out of the anther on to it.

The floral mechanism thus appears to be very similar to that of the English Bearberry, *Arctostaphylos uva-ursi* Spr.

RHODODENDRON.

This genus includes both the *Rhododendrons* and the *Azaleas* of English gardens; the former with evergreen leaves and flowers in close bunches, the latter with annual leaves and more scattered flowers.

Shrubs and small trees with alternate often leathery leaves and large winter buds. Flowers regular or nearly so. Corolla five-lobed. Stamens ten, not attached to the corolla. Ovary five to twenty-celled with single style and capitate stigma, which like the stamens is slightly bent upwards. Fruit a woody capsule, opening from the top downwards into its component carpels but leaving a central axis. Seeds many and small.

Species about 200, with numerous natural varieties: and now, in cultivation, many hybrids and garden varieties. For the most part natives of the region between southern China and the south-west Himalayas, but extending also to Japan, the islands north of it, and North America, on the one side; and on the other to the Caucasus and southern Europe (4 sp.). North Australia has one species and South India one.

The *Rhododendrons* of English gardens have nearly all sprung, from seed collected by the late Sir Dr. J. H. Hooker in the Sikkim Himalayas (1847-51).

Rhododendron arboreum Sm.; *F.B.I.* iii 465, VIII 10. A small tree with stiff elliptical white-backed leaves, erect in bud, and masses of blood-red or crimson flowers, very conspicuous in January.

Height 15 to 20 feet; bark very thick and rough. Leaves elliptic or lanceolate, acute at both ends, rusty or silvery-white underneath, dark green above, very coriaceous and stiff, with strongly recurved margins; in bud erect and showing their silvery backs, later spreading

or drooping, but stiffly; about two and a half times as long as broad, 3 to 6 inches long, with stalk of $\frac{1}{2}$ to $\frac{3}{4}$ inch. Flowers subsessile, in dense terminal bunches 4 to 8 inches across. Bud of the whole inflorescence egg-shaped, with at the base three or four rows of empty, closely imbricate, $\frac{1}{2}$ to $\frac{3}{4}$ inch, broadly-ovate and apiculate bracts, with scarious and ciliate margin and tomentose backs: inner flowering bracts similar. Corolla $1\frac{1}{4}$ inches long and wide, red. Capsule oblong, $\frac{3}{4}$ by $\frac{3}{8}$ inch, woody. t. 179. Wight Sp. Nilg. t. 131.

Very common on both plateaus. Nilgiris: everywhere, quite common in and near Ootacamund. Pulneys: conspicuous on exposed hill-tops where, apparently, its thick bark enables it to stand the yearly grass fires without hurt. *Fyson* 340. *Bourne* 48.

Gen. Dist. Mountains of South India, Himalayas, Burma.

PRIMULACEÆ.

Perennial herbs with alternate or opposite, often radical, leaves; and perfectly regular flowers with five-lobed calyx, five-lobed monopetalous corolla, five stamens attached to the corolla tube *opposite* its lobes, superior ovary of one cell with free central placenta covered with kidney-shaped ovules, and capsular fruit opening by a transverse slit or in valves.

Species 100, chiefly in temperate and Alpine regions.

In Europe are *Primula* (Primrose, Cowslip, *Fr.* Primevère, *Ger.* Schlüssel-dume); *Hottonia* (Water-violet); *Cyclamen*; *Centunculus*; *Glaux*; *Samolus* (Brookweed); *Lysimachia*; *Anagallis*

Capsule opening by valves *LYSIMACHIA*.

Capsule opening by transverse slit *ANAGALLIS*.

LYSIMACHIA.

F.B.I. 87 v.

Stem herbaceous, erect or creeping. Leaves alternate or opposite, simple. Flowers in racemes, or solitary at the leaf-axils. Corolla *twisted* in bud (distinction from

Primula, etc.). Stamens attached to the base of the corolla and opposite its lobes. Ovary globose: style slender, persistent on the capsule which opens *by valves*. Seeds many with thick tight seed-coat.

Species about 60, mostly in the sub-tropical and temperate climates of the northern hemisphere but a few also in tropical and southern Africa, Australia and South America.

In Britain 4 species—Loosestrife, Yellow Pimpernel, etc.

Lysimachia leschenaultii *Duby*; *F.B.I.* iii 501, V 1; Pink Loosestrife.

* (*Ordinary form*). A small herb, perennial by a knotted rootstock. Stem round, pubescent, reddish, clothed to the base by the green or withered leaves. Leaves opposite or nearly so, often tufted because of axillary buds, oblanceolate, entire, finely white-dotted below, glabrous above and mottled with brown internal glands, herbaceous, erect: veins green, scarcely visible. Flowers in a close terminal handsome raceme 2 to 4 inches long, pink. Bracts linear, $\frac{1}{4}$ inch: pedicel $\frac{1}{2}$ to 1 inch, slender. Sepals $\frac{1}{6}$ inch, lanceolate, acuminate, with thin margins. Corolla tube short; lobes (petals) obovate, $\frac{1}{3}$ inch, spreading. Stamens slightly longer, spreading and well exerted. Fruit a perfectly round capsule, $\frac{1}{8}$ to $\frac{1}{6}$ inch, sitting inside the now recurved sepals, and surmounted by the filiform $\frac{1}{4}$ inch style; at length opening in five or six oblong valves which spread out flat. Seeds about eleven, black, with rounded outer (dorsal) side and ridged inner, and covered all over with a fine raised network. t. 180. Wight Ic. t. 1204; Sp. Nilg. t. 132.

In wet places, very common on the Pulneys, on the open downs and round the shores of the lake at Kodaikanal. Nilgiris: near Ootacamund but not common; on the downs to Pykara and Kotagiri. *Fyson* 290, 678, 456, 2058. *Bourne* 58.

Gen. Dist. These mountain-tops only.

**** (Large form).** Stem as thick as a lead pencil, growing up to 4 feet, finely pubescent with red or yellow hairs, not so well clothed as the ordinary form, because the axillary buds are not so leafy. Leaves spreading, narrowed to the broad short stalk, elliptic, acute, margin finely waved, pinkish and the veins purple, with numerous superficial purple dots of various sizes, and also internal brown glands. Flowers in racemes terminating the axis and branches: lower bracts leaf-like, longer than the pedicels, which run up to $1\frac{1}{2}$ inches. Sepals $\frac{1}{4}$ inch, mauve. Corolla pink, funnel-shaped; tube $\frac{1}{16}$ inch; lobes $\frac{1}{3}$ inch; the lowest $\frac{1}{12}$ inch contracted to slightly less than the tube, the upper $\frac{1}{4}$ inch, flat and spreading, broadly obovate. Stamens at the mouth of the corolla, exactly equal to the petals; filaments subulate, pink, anthers dark purple.

Pulneys: in sholas, higher than Kodaikanal. *Fyson* 2059. *Bourne* 1852.*

The height, 6 to 8 feet, given in F.B.I. is unusual and perhaps due to an error in the reading of a Collector's note on a sheet at Kew (which rather lends itself to such a mistake). The plant is usually much less.

This species is closely allied to and somewhat similar to the European *L. vulgaris*. *Eng.* Yellow Loosestrife. *Fr.* Corneille. *Ger.* Goldfelberich.

***Lysimachia deltoides* Wight, Cat. 109!; F.B.I. iii 505, V 14; Creeping Jenny.** A trailing herb with, mostly opposite, ovate leaves and flat yellow flowers; closely allied to and not unlike the Creeping Jenny of England.

Stem slender, round, pubescent, purple or brownish, prostrate; all except the corolla hairy or pubescent. Lower leaves opposite, upper alternate, their stalks $\frac{1}{8}$ to $\frac{1}{4}$ inch, brownish purple like the stem; blades broadly ovate, of the lowest leaves as little as $\frac{1}{8}$ inch long, of the middle ones $\frac{3}{4}$ by $\frac{1}{2}$ inch larger or smaller, usually more or less erect. Pedicels solitary in the leaf-axils, slender, $\frac{3}{4}$ to 2 inches. Sepals $\frac{1}{4}$ inch, lanceolate, acute, covered outside and in with small red glands. Petals $\frac{1}{4}$ by $\frac{1}{5}$

inch, ovate, obtuse, with a few red glands, and connected only at the base into a tube of $\frac{1}{20}$ inch. Stamens five: filaments connate at the base into a tube $\frac{1}{20}$ inch, seated on the corolla tube and bent abruptly inwards above: anthers $\frac{1}{16}$ inch opening inwards. Fruit a capsule. t. 181. Wight Ill. t. 144.

On cool shady banks and on the open damp hill-side. Pulney downs: in and near Kodaikanal. Nilgiris: Ootacamund, Pykara and Coonoor. *Fyson* 310, 2125. *Bourne* 1157.

Gen. Dist. Ceylon, Nilgiris and Pulney mountains only.

All the sheets from both the Nilgiri and Pulney mountains at Kew (August 1914) are named in Sir J. D. Hooker's writing "*var cordifolia*." Wight's Herb. Prop. No. 109, named by him "*L. deltoides R.W.*" and presumably therefore the type plant, is a Ceylon specimen. I am unable to distinguish it from ours.

Closely allied to the European *L. nummularia* L., *Eng.* Creeping Jenny or Money-wort, *Fr.* Chassebourse, *Ger.* Egelkraut; and also to *L. nemorum* L., *Eng.* Yellow Pimpernel, *Fr.* Corneille de bois.

ANAGALLIS.

F.B.I. 87 VII.

Slender herbs with opposite entire leaves and solitary blue or red flowers stalked, without bracteoles in the leaf-axils, and characterised by the flat corolla of five lobes twisted in bud, the filaments of the stamens hairy, and the globose, circumsciss, capsule (opening by a transverse slit). Seeds numerous plano-convex, attached by the middle.

Species in north temperate regions and temperate South America.

Anagallis arvensis Linn.; *F.B.I.* iii 506, VII 1; common Pimpernel. Stem weak, four-angled. Leaves opposite, subsessile, ovate, glabrous, gland-dotted, entire. Flowers on long slender pedicels in the leaf-axils. Sepals five, linear, $\frac{1}{4}$ inch. Corolla $\frac{1}{2}$ inch, pink or less often blue. Capsule globose surmounted by the style, and opening by an equatorial split. Seeds many. Wight Sp. Nilg. t. 133 (*A. latifolia*).

Nilgiris : Lovedale and Ootacamund. Pulneys : Shembaganur. *Bourne* 430.

A common weed of cultivation in the cooler temperate regions.

Known also in England as Poorman's Weatherglass, *Fr.* Meuronne des champs, *Ger.* Roter Gauchheil.

MYRSINACEÆ.

Shrubs and small trees with alternate simple gland-dotted leaves, and regular flowers : corolla monopetalous with short teeth and usually five lobes : stamens as many opposite the lobes ; anthers opening by slits (not terminal pores) : ovary one-celled with free central placenta : fruit small, sub-baccate : seeds one or more, globose, with transverse embryo, and endosperm pitted or indented by the folding of the inner seed coat.

Species 500, all tropical or sub-tropical.

Leaves toothed : flowers in racemes	MÆSA.
Leaves entire with brown glands : flowers fascicled	MYRSINE.
Leaves entire : flowers pink in racemes	ARDISIA.

MÆSA.

F.B.I. 88 I.

Shrubs and small trees with alternate, entire or toothed, leaves and small flowers in terminal or axillary simple or branched racemes, with a small bract subtending the pedicel, and two bracteoles at the base of the calyx. Sepals, corolla lobes, and stamens five. Fruit enclosed, not quite to the top, in the calyx-tube.

Species 35 ; or according to some authors, by splitting of species, over 100.

Mæsa perrottetiana DC. ; *F.B.I.* under *M. indica* Wall., iii 509, I 5.* Shrub, with much-lenticelled twiggy branches. Leaf-stalks $\frac{3}{4}$ inch : blades variable, usually broadly ovate, narrowed at the base, acute or shortly acuminate with sharp triangular serrations, glabrous :

nerves about eight to ten on each side nearly straight. Racemes slender, 2 to 4 inches, sometimes branched: pedicels $\frac{1}{8}$ inch. Sepals not ciliate. Corolla when open $\frac{1}{8}$ inch. Fruit $\frac{1}{8}$ inch globose, with calyx-teeth showing near the top, and surmounted by the small style. Seeds many on a round placenta which projects into the hollow of the fruit from one side. Wight Ic. t. 1206; Sp. Nilg. t. 134.

Nilgiris: very common in the shola at Kotagiri. Coonoor: not at higher levels. Also Shevaroy's at Yercaud. *Fyson* 1726, 41. *Bourne* Coonoor, etc.

This was included by C. B. Clarke in F.B.I. under *M. indica* Wall. as a variety. I have not seen Roxburgh's plant (Wallich's type) but it was a native of Chittagong (Roxb Fl. Ind. Ed. Carey and Wallich ii 230) and examples from the same district have sinuate almost entire, not sharply serrate leaves, much shorter and more divided axillary panicles of flowers and ciliate sepals. Whether these differences are of specific or varietal rank must largely be a matter of opinion.

MYRSINE.

Shrubs and trees with rather thick branchlets on which the flowers are closely set in small fascicles, and small one-seeded fruits, with the endosperm more or less indented by the seed-coat.

Species about 100, natives mostly of the tropics of Asia, Africa and America, a few in extra-tropical Africa, the Atlantic islands and New Zealand.

C. Mez in a monograph of the family (*Das Pflanzenreich* iv 236) makes 143 species, nearly all of which he puts in a new genus *RAPANEA* leaving only 4 to *MYRSINE* proper and 3 between two other genera. *RAPANEA* is separated from *MYRSINE* because of the absence of any style between the ovary and the large stigma, and the much less ruminant endosperm.

Myrsine wightiana Wall., *Cat.* 2300! (*Rapanea* of Mez.); *F.B.I.* as *M. capitellata* var *lanceolata*, iii 512; II 3.* A tree with erect gland-streaked leaves, mostly at the ends of the branchlets and small flowers thickly set lower down on them.

Tree with ascending branches, occasionally very large; when small pyramidal or sharply pointed in outline.

Leaves erect, $1\frac{1}{2}$ to 3 inches by $\frac{3}{4}$ to $1\frac{1}{4}$ inches, oblanceolate-obtuse, narrowed to the short stalk; upper side dark dull green, underside with translucent dots or narrow streaks (oil glands). Flowers fascicled in the axils of the fallen leaves on pedicels of $\frac{1}{6}$ to $\frac{1}{4}$ inch. Petals $\frac{1}{12}$ inch. Ovary $\frac{1}{16}$ inch, with a thick stigma, equally long, jointed to it. Fruit $\frac{1}{8}$ inch globose, occasionally fleshy on the outside and then $\frac{1}{4}$ inch: stigma long persistent but at length falling. t. 182. Wight Sp. Nilg. t. 137; Ic. t. 1211.

Nilgiris: on the plateau; very common in and near Ootacamund and down to Coonoor. Pulneys: in some of the sholas on the downs above Kodaikanal as very large trees, pedicels of flowers longer. *Fyson* 2127, 1890, 1719. *Bourne* 481.

Gen. Dist. These hills, Western Ghats, Bababoodons.

Myrsine capitellata *Wall. Cat.* 2296! with which this is united in F.B.I. as a variety, is a Nepal plant with much larger leaves and nearly sessile flowers.

The ascending branches and erect leaves, of our plant, are very characteristic, as also are the flowers and small fruits thickly set on the branchlets just below their leafy tips, much as in *Eurya japonica* (p. 42), from which species however, even in fruit, the toothless leaves, their oil-glands, and the single seed, at once distinguish our plant.

The fleshy covering to the fruit I have found very perfect on the Ootacamund downs in May. Possibly, as suggested by Wallich this is in the nature of a gall. A similar growth on *M. africana* *L.* had been noticed before and appears (as seen by me on a South African specimen) very similar. The 'scales' of Clarke's *var lepidocarpon* (F.B.I. *l.c.*) (*Fyson* 2581 *) and the "emergences" of Mez. (*l.c.* s. 10) appear to be the dried and decaying remains of this.

ARDISIA.

F.B.I. 88 v.

Ardisia humilis *Vahl*; *F.B.I.* iii 529, V 45. A tree with alternate 6 by 2 inches, entire, leaves; axillary 3 or 4 inches, racemes of pink flowers; and globular fruit, with a single seed.

Pulneys: possibly at Kodaikanal. *Bourne* 610. Common at low levels throughout India.

SAPOTACEÆ.

Trees and shrubs with rust-coloured tomentum on the younger parts ; alternate, leathery, entire, leaves ; and axillary clusters of perfectly regular monopetalous flowers, with four to eight sepals in one or two whorls, a four or five-lobed corolla and a superior ovary of as many one-seeded cells : characterised by the seed having a very hard shiny coat and long hilum-scar, and in many, but not all cases, by there being developed on the backs of the corolla-segments other lobes, so that there appear to be several concentric circles of petals, and by the presence often of two or three circles of stamens and an inner circle of staminodes.

Species 350 in the tropics of the whole world. On the plains *Bassaia*, *Mimusops*, and *Achras sapota* the Sapodilla (cultivated).

SIDEROXYLON

F.B.I. 89 III.

Trees with alternate entire leathery leaves, rusty-tomentose on the young parts and flower-stalks. Flowers clustered at the leaf-axils, subsessile or shortly pedicelled. Sepals five, imbricate. Corolla tube campanulate ; lobes five. Stamens five attached to the base of the corolla ; staminodes five lanceolate. Ovary villous, five-celled. Berry egg-shaped, with five or four seeds.

Species 60, mostly in the tropics.

Sideroxylon tomentosum Roxb. ; F.B.I. iii 538, III 7. Easily recognised when in flower by the downward pointing closed flowers, like sharp cones with protruding curved style.

A small tree : young shoots, sepals, and veins, and upper side of petioles, rusty tomentose. Branches horizontal ; twigs lenticelled. Leaves alternate, erect and spreading : often arched and margin recurved. Petiole

$\frac{1}{4}$ inch: blade $1\frac{1}{2}$ to $4\frac{1}{2}$ inches by $\frac{3}{4}$ to 2 inches, elliptic or obovate, entire, glabrous except for a little tomentum on the impressed veins, shiny, hard: nerves about eight on each side, reticulation fine. Flowers two or three together in the upper axils, facing downwards. Pedicel $\frac{1}{4}$ inch, rusty. Sepals four to five, triangular acute, $\frac{1}{5}$ inch, very rusty. Corolla tube $\frac{1}{8}$ inch: lobes acute slightly longer than the sepals, with the edges curved inwards as they fade. Staminodes five, alternate with the petals, and close against the ovary, acuminate, contracted at the base, fimbriate densely hairy on the inside. Stamens between and inside the staminodes: filaments half the corolla lobes; anthers acute, half the filaments. Ovary very hairy; style slender, long exserted. Fruit sitting on the dried calyx, the size of a small Indian egg, one to five-celled, with milky flesh, smelling like a green apple. Seeds one in each cell, with very hard, brown shiny coat which is incomplete and leaves a long gash on the inner, ventral, side; endosperm white, oily, embryo straight cotyledons thin. t. 183. Wight Sp. Nilg. t. 141.

In sholas on the Nilgiri and Pulney plateaus, common, flushing a blaze of scarlet with young leaves in December. Flower and fruit before the rains. Especially common between Ootacamund and Pykara. *Fyson* 2006, 2468, 2483. *Bourne* 962.*

Gen. Dist. Western Ghats; Pegu and Martaban (F.B.I. fide Kurz), Ceylon.

I have found, on an occasional flower, tiny scales on the outside of the petals, near the tip.

The mechanism of pollination appears to be as follows: The buds point downwards at about half a right angle, with the style protruding and always curled upwards. The stigma appears to be receptive at an early stage, though more so later on. When the flower opens the petals spread widely, with the anthers which have already dehisced, pressed up against them by their stiff filaments. The staminodes are curled inwards with rounded backs and tips curled up against the style, so covering the nectariferous disc. This latter is usually dry, but

central bundle-scar. Leaf-stalks stout, $\frac{3}{4}$ by $\frac{1}{8}$ inch, the older often scarred below, obscurely channelled above. Leaves pendant, very thick, glossy like the common Laurel of English gardens, ovate-elliptic, serrate, the teeth extending from the apex where they are $\frac{1}{16}$ inch apart, to about two-thirds of the way down, and there $\frac{1}{6}$ inch apart but barely visible: midrib stout, nerves about seven on each side, very slender. Spikes of flowers axillary and branched near the base, cymosely, into three, with two ovate clasping bracts; pubescent. Flowers sessile, with a small bract and two equally small bracteoles. Ovary inferior, covered by a green disc. Calyx-teeth triangular, $\frac{1}{30}$ inch. Petals $\frac{1}{6}$ inch, white, but later tinged with yellow, rounded, united at the base in a very short tube, to which are attached the numerous stamens. Filaments straight, $\frac{1}{8}$ to $\frac{1}{4}$ inch, white: anthers minute, yellow. Style as long, widening at the tip to the small yellow stigma. Fruit $\frac{1}{5}$ inch, nearly globose, ribbed or smooth with short broad calyx-tube above. Wight Ill. t. 150.

This variety (*laurina*) has shorter spikes and larger flowers than the type and often smaller leaves. Kotagiri specimens have however large leaves.

Pulneys: on the downs above Kodaikanal, by streams. Nilgiris: Kotagiri, Coonoor and lower levels down to 3,000 feet on the Mysore plateau. *Fyson* 427, 1121, 1706, 3040. *Bourne* 172, 1356.

Gen. Dist. (of the species) from Sikkim through Khasia and Assam to Burma and Malacca, China, Japan, Australia and Polynesia (a variety or possibly another species.)

The white flowers are at first sight very like those of the Black-thorn, and smelling much the same, might easily be mistaken by any one acquainted with the English flora for one of the family ROSACEÆ, especially as the tubular part of the corolla is excessively short, and being covered by the stamens does not appear till the corolla is removed.

Symplocos foliosa Wight; *F.B.I.* iii 582, I 39. A tree with smooth grey bark, lumpy foliage, large silky leaf-buds, flowers $\frac{1}{3}$ or $\frac{1}{2}$ inch, in short axillary spikes;

and peculiar in the toothing of the leaves which extends from the apex almost to the stalk.

Young parts and leaf-stalks hairy, older branchlets glabrous with but few lenticels. Leaf-stalks $\frac{1}{4}$ to $\frac{1}{2}$ inch : blades ovate or broadly elliptic, 2 to 6 by $1\frac{1}{4}$ to $2\frac{1}{2}$ inches, acute or acuminate, serrate almost to the base : leaf-buds $\frac{1}{2}$ inch, globular, silky. Flower-spikes erect, strongly pubescent : flowers subsessile. Calyx-tube $\frac{1}{8}$ inch, pubescent. Corolla $\frac{1}{2}$ inch. Stamens very many (forty). Fruit erect, yellowish green, $\frac{5}{8}$ by $\frac{1}{4}$ inch, oblong, rounded at both ends, with a small calyx-scar at the top. t. 184. Wight Ic. 1234 and 1235.

In sholas where it may be recognised by its lumpy foliage, on both plateaus ; flowering winter and spring, fruiting early summer. Not elsewhere. *Fyson* 1895, 2079, 2585. *Bourne* 473, 1498, 1588.

In its smooth bark and silky young leaves it reminds one of the English Beech.

Symplocos obtusa *Wall.* ; *F.B.I.* iii 583, I 43. A tree, all parts glabrous. Branches sub-umbelled, usually four at a forking ; youngest tinged with purple ; the previous year's with thin almost black bark, marked with a few longitudinal lenticels ; older with grey bark. Leaf-scars $\frac{1}{8}$ inch across : leaf-stalks $\frac{1}{2}$ inch, purple : blades erect, 2 to $3\frac{1}{2}$ by 1 to $1\frac{1}{4}$ inches, elliptic or obovate-elliptic, emarginate or obtuse, shallowly crenate except near the acute base, with minute points in the crenations, thickly coriaceous ; margins reflexed ; nerves about six pairs, translucent. Spikes axillary, 1 to 2 inches. Flowers five to eight, white, $\frac{1}{2}$ inch across, quite glabrous : bracts $\frac{1}{2}$ inch soon falling. Calyx-tube sessile, $\frac{1}{8}$ inch : lobes rounded, $\frac{1}{20}$ inch. Petals $\frac{1}{5}$ inch, concave tinged on the outside, like the calyx lobes, with pink : tube $\frac{1}{50}$ inch. Stamens many, the innermost shortest : disc to which they are attached glabrous. Stigma

three-lobed, velvety, dark brown. Scent very slight.
t. 185. Wight Sp. Nilg. t. 146; Ic. t. 1233.

Pulneys: in sholas above Kodaikanal. Nilgiris: about Ootacamund flowering spring months. *Fyson* 2368.

Gen. Dist. South Indian mountain tops only. Examples from Ceylon though nearly allied appear to be different.

***Symplocos pendula* Wight; F.B.I. iii 587, I 60.** A tree with erect entire smooth leaves and small pinkish flowers and narrow oblong fruits, hanging at the leaf-axils.

Tree up to 20 feet: bark rough. Leaves smooth and glossy, quite entire, obovate or elliptic, acute at both ends or bluntly acuminate 2 to $3\frac{1}{2}$ by 1 to 2 inches, erect on the short pink stalk: midrib strongly impressed on the upper side. Flowers two or three together at the leaf-axils: pedicels $\frac{1}{6}$ inch, with a small bract at the base, and broadening above into the $\frac{1}{8}$ -inch calyx-tube. Corolla $\frac{1}{2}$ inch, pink. Style longer, with capitate stigma. Fruit oblong, rounded at each end, hanging, with the dried calyx lobes at the base quite small and contracted and enclosing one stone. t. 186. Wight Ic. t. 1237.

Pulneys: in sholas on the downs 7,000 feet and above. Not on the Nilgiris. *Fyson* 2096. *Bourne* 397, 425.

Gen. Dist. Also Ceylon.

OLEACEÆ.

Privet and Jasmine.

Shrubs, sometimes climbing, and trees, with opposite leaves. Flowers regular with small calyx, a monopetalous corolla of five or more lobes, but only two stamens, and superior ovary of two cells each with one seed. Fruit a capsule drupe or berry.

Species 300 in tropical and temperate regions.

The family is divided into four tribes represented by (i) Jasmine, (ii) Lilac, (iii) Ash and (iv) Olive and Privet. The first and last only of these are represented here.

- a { Flowers $\frac{1}{2}$ inch, or more, solitary or few: petals imbricate in bud *p.* 275. JASMINUM.
 { Flowers $\frac{1}{4}$ inch, in panicles: petals not overlapping. b
- b { Endocarp bony: leaves 2 by 2 inches *p.* 278. OLEA.
 { Endocarp bony: leaves 6 by 2 inches. *p.* 277. LINOCIERA.
 { Endocarp thin, papery: leaves lanceolate *p.* 279.
 LIGUSTRUM.

JASMINUM.

F.B.I. 92 I.

Shrubs or woody climbers with opposite, simple or pinnate leaves. Flowers with narrow tube and spreading lobes, imbricate in bud. Fruit a two-lobed berry (unless one carpel fails to develop), each lobe with one seed in which the radicle points downwards.

Species 140 to 160 nearly all in the tropics of Asia and Africa; and of these over 50 in India.

Many have particularly fragrant flowers and are common as cultivated plants, e.g., *J. sambac Ait.*, on the plains and all over the tropics of both hemispheres: *J. officinale L.*, the common white-flowered climber of English and our hill gardens, but a native of Kashmir and Persia.

Jasminum sambac Ait., var heyneana; F.B.I. iii 591, I 1. Scandent with thin flexible stem. Leaves simple, ovate with rounded or cuneate base, acute or obtuse, nearly glabrous, $\frac{1}{2}$ to $1\frac{1}{2}$ inches. Cymes three-flowered. Calyx-teeth $\frac{1}{16}$ to $\frac{1}{8}$ inch. Corolla tube $\frac{1}{2}$ inch.

Pulneys: near Kodaikanal in Bearshola. *Bourne* 2380.*

Clarke in F.B.I. suggests that this is a cultivated variety.

Jasminum brevilobum DC.; F.B.I. iii 600, I 33. A shrub with weak scandent softly hairy branches, shortly stalked ovate leaves and terminal bunches of white flowers.

Branches terete pubescent. Leaf-stalks $\frac{1}{4}$ inch: blade $1\frac{1}{4}$ by 1 inch, ovate with very rounded or subcordate base and small mucro, entire; pubescent on the underside like the stalk, less so or nearly glabrous on the upper; sometimes with, sometimes without, a pair of

small lobes or leaflets. Flowers in terminal capitate cymes. Corolla tube 1 inch, lobes $\frac{1}{2}$ inch. Carpels in fruit black, $\frac{1}{3}$ inch. t. 187.

In thickets and on the outskirts of sholas, common on both plateaus. Nilgiris: everywhere about Ootacamund, flowering after the monsoon rains, and down at least to Kotagiri and Neduwattum. Pulneys: not on the highest levels but below at Poombari, flowering June. *Fyson* 1862, 1888, 2939. *Bourne* 4784, 4651, 3051.*

Gen. Dist. South Indian hills.

Jasminum auriculatum *Vahl*; *F.B.I.* iii 600, I 32. Similar to *S. brevilobum* *DC.*, but leaves nearly glabrous, flowers smaller, and in open compound cymes peduncled in the upper axils. Corolla tube $\frac{1}{2}$ inch: lobes $\frac{1}{4}$ inch. Fruit $\frac{1}{4}$ inch. Wight *lc.* tt. 1255, 1256.

Nilgiris: Ootacamund *Wight*. Pulneys: Bearshola near Kodaikanal *Bourne* 1590. Courtallum *Foulkes*.

Belongs properly to lower levels and is cultivated in many parts of India.

Jasminum bignoniaceum *Wall. ex DC.*; *F.B.I.* included in *Jasminum humile* *Linn.*, iii 602; I 40;* Golden Trumpet. An erect shrub with numerous green, very angular branches: bud scales persistent as a cup at the base of the year's shoot: youngest parts pubescent. Leaves alternate, 1 to 3 inches, pinnate with about seven leaflets: main stalk grooved above, green: leaflets $\frac{1}{2}$ by $\frac{1}{4}$ inch, elliptic-acute at both ends, or diamond-shaped, dull green on both sides. Flowers solitary or in dense cymes at the ends of the twigs, full yellow: pedicel $\frac{1}{3}$ inch, pubescent, expanded below the calyx. Calyx $\frac{1}{12}$ inch; teeth five, triangular, very small. Corolla-tube $\frac{1}{2}$ to $\frac{5}{8}$ inch, $\frac{1}{16}$ inch wide at the base and $\frac{1}{6}$ inch just below the spreading $\frac{1}{4}$ inch limb of five triangular lobes. Anthers $\frac{1}{8}$ inch, sessile near the top of the tube, opening inwards. Style bent, appressed to one side of

the corolla-tube at the base; stigma large, exerted above the corolla. Fruit of two globose berries, $\frac{1}{4}$ to $\frac{1}{3}$ inch each. Wight Sp. Nilg. 151.

Nilgiris: near sholas, all over the downs flowering April. Pulneys: Glen falls near Kodaikanal, etc., apparently nowhere else. *Fyson* 295, 2554, 1692. *Bourne* 228.

The style is too long for the bud and is bent up inside it. When the flower opens the style straightens and carries the apparently ripe stigma outside and well above the anthers. The stigma is large and could hardly fail to be touched by an insect visiting the flower.

I have not seen authentic specimens of *J. humile* L., with which this is united in F.B.I.; but in his description (Sp. Pl.) Linnæus says distinctly "leaves trifoliate, very seldom pinnate." He gives no country of origin, and Aiton, to whom reference is made, in *Hortus Kewensis*, only says that it is a garden plant brought from Italy. De Candolle in *Prod. VIII*, p. 313, gives France and Spain as the home of plant. The figure in *Bot. Reg.*, t. 350, shows trifoliate leaves and a salver-shaped corolla, i.e., with narrow tube and spreading lobes, clearly a different plant from ours. *J. wallichianum* *Lindl.* *Bot. Mag.* t. 1409, a synonym in the F.B.I., is a native of Nepal and has pinnate leaves, larger than our plant and more like *J. officinale*, but the flowers of *J. humile* L. *J. chrysanthemum* of Roxburgh appears from his description to be the same. *J. revolutum* *Sims*, *Bot. Reg.* t. 1731, another synonym, has larger leaflets and very much larger flowers, with wide spreading lobes and short tube. I cannot doubt that all these are really distinct from our plant, and have therefore gone back to Wallich's name, published by De Candolle. Other sheets at Kew from South India are Gardner in 1847. Hooker and Thompson No. 2888. W. Russell in 1838. Foulkes "J. revolutum in 1850 and 1851. Hohenacker No. 1079. Wight Kew Dist. 1753.

LINOCIERA.

F.B.I. 92 VII.

Shrubs or trees with the characters of the family (q.v.), but simple entire leaves and axillary panicles of small flowers, characterised by the four petals being separate or connected only at the base, and valvate in bud; the fruit with hard endocarp and a single pendulous seed.

Species 40, in the tropics.

Linociera intermedia *Wight*; *F.B.I.* iii 609, VII 6. A tree. Leaves 6 to 8 inches by 2 to 3 inches, obovate-acute at both ends, shortly stalked, glabrous, with about

ten pairs of nerves. "Panicles 3 to 4 inches. Flowers $\frac{1}{4}$ inch. Calyx $\frac{1}{16}$ inch. Fruit $\frac{2}{3}$ by $\frac{1}{3}$ inch."

Pulneys : Gundan shola. *Bourne* 1267. (No flowers or fruit seen.) Nilgiris : on the eastern slopes. *Wight*.

O L E A .

F.B.I. 92 VIII.

Olive.

Shrubs and trees with opposite leaves and terminal or axillary panicles of small flowers with four small calyx points, four corolla lobes folded inwards not twisted in bud, two stamens, an ovary of two cells each with two pendulous ovules, and fruit an ellipsoid or nearly globular drupe resting in the cup-shaped enlarged top of stalk, with one seed only enclosed by a hard bony endocarp (distinction from *LIGUSTRUM*).

Species about 35, from the north temperate zone southwards to South Africa and New Zealand.

Olea bournei *Fyson* ; VIII 2.* A tree, standing sometimes higher than the rest of the shola, occasionally in the open. Branches grey, much lenticelled ; the smaller twigs very regularly opposite and decussate, slightly or much swollen at the nodes. Leaves spreading or laxly drooping : stalk $\frac{3}{4}$ to 1 inch, slender, appressed, against the stem, puberous : blade lax, broadly ovate or elliptic-acuminate, narrowed at the base to the stalk, dark green, and shiny on the upper side, paler below, quite glabrous : nerves irregular about four pairs, commonly with small perforated swellings in the axils. Flowers in regular decussately branched panicles, terminating the branches and in the upper axils, fragrant : peduncle 1 to $1\frac{1}{2}$ inches : ultimate pedicels $\frac{1}{30}$ inch, or less. Buds globular $\frac{1}{20}$ inch. Corolla $\frac{1}{6}$ inch across, nearly flat ; the petals rounded, $\frac{1}{16}$ inch. Calyx half as long.

Stamens as long as the petals, spreading outwards; anthers round. Style very short, compressed laterally, green. Fruit a green drupe, $\frac{1}{2}$ by $\frac{1}{4}$ inch. Seed with a groove on one side, and thick horny endosperm. t. 188.

Nilgiris : in sholas on the slopes of Vengadu, 7,000 feet and elsewhere on the Ootacamund downs. *Fyson* 2462. Pulneys : Gundattu shola. *Bourne* 1591.

Allied to *O. glandulifera* *Wall.*, but differs in the rounder leaves and few nerves.

LIGUSTRUM.

F.B.I. 92 IX.

Privet.

Shrubs and small trees with opposite, simple, uncut leaves, and terminal panicles of small white or cream-coloured flowers of four united petals. Fruits, drupe-like, with one seed only enclosed in a horny endocarp, the embryo having its radicle pointing upwards.

Species 30, mostly in Asia, 14 belonging to China.

Corolla tube twice as long as the calyx . . . *L. perottetii*.

Corolla tube shorter than the calyx . . . *L. walkeri*.

***Ligustrum walkeri* Desne. ! ; F.B.I. iii 614, IX 2.** A tree, about 20 feet : younger branches with many lenticelled and very pubescent ; older less so. Leaves 2 to 3 by $1\frac{1}{2}$ to $1\frac{1}{4}$ inches, lanceolate, acute, narrowed to the base, spreading. Panicle terminal, pubescent : flowers in small fascicles on its branches : pedicels $\frac{1}{16}$ inch. Corolla tube shorter or not much longer than the calyx. Fruit $\frac{1}{4}$ by $\frac{1}{6}$ inch, not quite symmetrical, seated in the cup-like dried calyx.

Nilgiris : by the edges of sholas, etc., on the downs towards Pykara. Kotagiri : on the Kodanad road. Pulneys : not at high, only near Perumal and lower levels. *Fyson* 1799, 1752, 400,* 3042. *Bourne* 183, 1543.

The leaves are usually larger and more pointed, the flowers in closer fascicles on the branches of the panicle, and the fruit smaller than in the much commoner *L. perottetii*.

***Ligustrum perottetii* DC., including *L. neilgherrense* Wight; F.B.I. iii 615, IX 4 & 5; Privet.** A small shrub, growing often in dense tufts 5 feet high and more wide, flowering profusely with panicles of fragrant white flowers, the corolla tubes much longer than the very small calyx, the petals $\frac{1}{4}$ inch long, curled back. Branches smooth with small lenticels. Leaves on the green years shoots only: stalk $\frac{1}{6}$ inch: blade 1 to $1\frac{1}{4}$ by $\frac{3}{4}$ to 1 inch, quite glabrous, but hardly shiny, ovate, acute at both ends: nerves about six pairs, joining each other inside the margin. Young leaves however sometimes 5 by $1\frac{1}{4}$ inches. Panicles 2 to 4 inches by $1\frac{1}{2}$ to 2 inches: lower bracts leaf-like, upper $\frac{1}{8}$ inch: branches with three or four pairs of sessile flowers in the axils of minute bracts. Calyx-tube $\frac{1}{20}$ inch; teeth minute. Corolla tube $\frac{1}{10}$ inch, or more, broadening above and in bud club-shaped; lobes $\frac{1}{8}$ inch by $\frac{1}{16}$ inch, spreading. Stamens inserted at the top of the tube; filaments distinct though short; anthers opening inwards. Fruit obovate-oblong or long egg-shaped, $\frac{1}{3}$ by $\frac{1}{6}$ inch, seated on the dried calyx, on a $\frac{1}{8}$ -inch stalk; usually in pairs. t. 189. Wight lc. tt. 1243 and 1245; Sp. Nilg. t. 148.

In the open as thickets and by sholas. Nilgiris: on the downs especially near water. A fine clump by the turning to Sholur near Sandy Nullah. *Fyson* 2248, 2394, 2478. *Bourne* 4631.

Wight (Ic. note on tt. 1243 and 1244) distinguishes *L. perottetii*, a small bush widely diffused, from *L. neilgherrense*, a large more local plant. I am unable to separate his specimens and reduce therefore the second species. At Coonoor and other lower levels its place seems to be taken by *L. walkeri* which has almost rotate flowers. The length of the corolla tube on which the distinction is based is sometimes difficult to determine in herbarium sheets, for the plant often flowers for a day or two only.

ASCLEPIADACEÆ.

Herbs usually climbing, with milky juice, and opposite simple often cordate leaves. Flowers quite regular; of five calyx-points, five corolla-lobes, five stamens, two separate carpels with short styles connected only by the large styler-head, and for fruit two follicles filled with flat oval seeds, each with a dense tuft of long white hairs. But styles very short and completely encased by the anthers which have very short filaments and join each other round it. Anther lobes of a stamen separated by a broad connective on the back of which, or on the base of the corolla, are developed swellings, collectively termed the *corona*. Pollen in each anther-cell or pollen-sac, aggregated into one (or occasionally two) lump, called a *pollinium*, and the polliniums of two adjacent-anther-lobes (of different anthers) connected, at the top in all our species, by a A-shaped piece usually black, termed the *translator* or *gland*.

Species 1,000 chiefly in the tropics.

Cross-pollination is effected by insects crawling over the flower and dragging a leg through the crevice between two adjacent anther-cells and removing the two polliniums connected by the A-shaped translator which fits astride the leg.

- | | | | |
|---|---|---|--------------------|
| a | { | Corolla closed, longer than broad, with inflated crown pierced by five openings . . . | p. 284. CEROPEGIA. |
| | | Corolla open, flat | b |
| b | { | Flowers yellowish brown: corona adnate to corolla . . . | p. 281. GYMNEMA. |
| | | Flowers green: corona attached to the anthers . . . | c |
| c | { | Petals valvate: corona a thick flat waxy five-rayed star. | p. 283. HOYA. |
| | | Petals overlapping | d |
| d | | Flowers in loose irregular racemes . . | p. 282. TYLOPHORA. |

GYMNEMA.

F.B.I. 95 XXX.

Herbaceous or woody slender twining plants with opposite leaves and axillary peduncled umbels (or

umbel-like cymes) of shallow or cup-shaped monopetalous flowers with petals overlapping to the right. Corona lobes thick and adnate to the corolla. Anthers with small membranous tip. Polliniums solitary in each cell (ten in all). Follicle terete, slender.

Species 28 in tropical and sub-tropical regions of Africa, Asia, and Australia.

Gymnema hirsutum *Wight and Arnott; Wight Herb. Prop. !; F.B.I. iv 29, XXX 2.* A fairly stout twiner, all green parts covered with soft brown pubescence, specially dense on the stem. Leaf-stalks $\frac{1}{4}$ inch: blades $1\frac{1}{2}$ to $2\frac{1}{4}$ by 1 to $1\frac{1}{4}$ inches, ovate acute or cuspidate. Cymes subsessile. Sepals $\frac{1}{20}$ inch. Corolla $\frac{1}{4}$ inch, yellowish-brown: lobes spreading, thickened and ciliate. Follicles $1\frac{1}{2}$ inches, slender, glabrous. t. 190. Wight Ic. tt. 1271 and 1272.

Nilgiris: near Ootacamund and to Pykara common, Coonoor. *Fyson. Bourne.* Not on the upper Pulneys. Not recorded with certainty elsewhere.

TYLOPHORA.

F.B.I. 95 XXXVI.

Herbaceous or woody slender plants, usually twiners, with opposite leaves and loose racemes (simple or branched) of small flowers with petals overlapping slightly to the right and spreading out flat. Coronal processes thick and fleshy, with short free tips, bending inwards and broadening outwards, attached to the stamens but free of the corolla. Anthers erect on very short filaments with membranous inflexed tips: polliniums one in each cell (ten in all) erect, minute. Follicle acuminate, smooth.

Species 40 in the tropical and sub-tropical regions of Asia, Africa and Australia, New Caledonia and Norfolk Isles.

All green parts softly hairy T. *mollissima*.
All parts glabrous T. *tenuis*.

Tylophora mollissima Wight, *Herb. Prop.* 1540!, "1837" 1; *F.B.I.* iv 43, XXXVI 16.

Softly hairy in all green parts. Leaf-stalks $\frac{1}{8}$ to $\frac{1}{2}$ inch: blades $1\frac{1}{2}$ to $2\frac{1}{2}$ by $\frac{1}{3}$ to 1 inch, oblong lanceolate, acute. Racemes 2 to 4 inches, zigzag, with two or more flowers at the bends on very slender $\frac{1}{8}$ -inch pedicels. Flower $\frac{1}{6}$ inch. Fruit not seen.

Nilgiris: Kotagiri. Pulneys: shola by Pamban stream. Possibly not truly above the 6,500 feet level. *Fyson. Bourne* 209, 1135.*

Gen. Dist. Nowhere else, but closely allied to *T. hirsuta* of Assam, Khasia and Himalayas.

Tylophora tenuis Bl.; *F.B.I.* iv 42, XXXVI 13. Stems slender, quite glabrous. Leaf-stalks $\frac{1}{6}$ inch: blades lanceolate with rounded base, 1 to $2\frac{1}{2}$ by $\frac{1}{2}$ to $\frac{3}{4}$ inch: nerves few, indistinct. Racemes 2 inches with two or three bunches of small dark purple flowers on stalks of $\frac{1}{4}$ to $\frac{1}{2}$ inch. Follicles 3 inches, slender.

Pulneys: Kodaikanal and below. Properly belongs to lower levels, e.g., Kotagiri, Shembaganur. *Fyson* 1490, 1913. *Bourne* 275, 464.

Gen. Dist. On the plains of Bengal near Calcutta, to Ceylon, Burma and Malacca.

HOYA.

F.B.I. 95 XLIV.

Woody climbers with thick leaves, and umbels stalked in one only of a pair of opposite leaf-axils. Flowers medium or large sized, not small: corolla lobes valvate (not overlapping) in bud and spreading out flat (stellate), very thick and waxy. Corona of five thick flat lobes. Anthers with membranous erect or inflexed tip. Polliniums solitary (ten in all), erect. Pods slender, pointed.

Species about 60 in the hotter parts of Asia and Australia, most abundant in the Malay Archipelago. Some cultivated in gardens for their waxy-looking flowers.

Hoya ovalifolia *Wight and Arnott* ; *Wight's Herb. Prop.* 1522 & 2213 ; *F.B.I.* iv 60, XLIV 33.

Stem thinner than a lead pencil, glabrous. Leaves elliptic but variable, very thick, shortly stalked. Peduncles 1 inch stout. Pedicel $\frac{1}{2}$ to $\frac{3}{4}$ inch. Flowers $\frac{1}{3}$ inch: petals 'pale straw coloured, broad, acute: coronal lobes ovate obtuse, the broader ends inwards, concave above, inner angle cuspidate.'

Pulneys: by the Pampan stream. *Bourne* 1125. Nilgiris and Mangalore. *Wight*. Ceylon. Very doubtfully native of these high levels.

CEROPEGIA.

F.B.I. 95 L.

Distinguished from all other plants by the corolla—a tube narrow in the middle, inflated at the base (round the ovary and stamens), and enlarged again at the tip and there closed in except for five lens-shaped openings.

Herbs or woody plants with tuberous rootstock and opposite ovate lanceolate or linear (not cordate) leaves. Flowers in axillary peduncled, umbel-like cymes. Corolla tube dilated at base and apex: lobes five, connate by their tips (and thus leaving openings between). Corona five or ten-lobed, with five scales or processes inside opposite the anthers. Anthers incumbent on the stylar head, without membranous tip. Pollen masses one in each anther-cell (ten in all), erect, sessile. Follicles slender, smooth, terete.

Species 80 in tropical Asia, Africa, Australia and South Africa.

- | | | | |
|---|---|--|-----------------------|
| a | { | Stem short, erect from a spherical tuber . . . | <i>C. pusilla.</i> |
| | { | Stem slender twining | b |
| | { | Dome of corolla hemispheric: ten coronal-lobes and five processes inside, all linear and equal . . . | <i>C. elegans.</i> |
| b | { | Dome of corolla longer than broad: processes five, longer than the short coronal lobes | <i>C. intermedia.</i> |

Ceropegia pusilla *Wight*; *F.B.I.* iv 66, L 1; the Little Lantern Flower.

Stem erect, 2 to 5 inches, rising from a tuber 1 inch or more broad, and slightly flattened. Leaves crowded, 1 to 3 by $\frac{1}{10}$ to $\frac{1}{3}$ inch, with one strong nerve, erect, minutely scabrous on the midrib and margins, otherwise glabrous: stem very distinctly swollen at the nodes. Peduncle usually displaced to one side of its subtending leaf, and with a very small linear bract at the base, $1\frac{1}{2}$ inches, erect, slightly pubescent. Flowers solitary as a rule, erect. Sepals $\frac{1}{8}$ to $\frac{1}{4}$ inch, linear. Base of corolla $\frac{1}{3}$ by $\frac{1}{5}$ inch, ovoid: tube $\frac{1}{2}$ by $\frac{1}{10}$ inch, five-angled: window portion $\frac{1}{4}$ by $\frac{1}{5}$ inch, the lobes $\frac{1}{20}$ inch wide, the openings a longish diamond shape, glabrous. Corona dark purplish brown, with ten dark purple, white-ciliate, teeth $\frac{1}{50}$ inch long, and five linear processes $\frac{1}{16}$ inch, meeting above the yellow central mass. Stamens thick, erect and separate from the styler head except at the base: pollinums erect, attached in pairs at the base. Follicles 2 inches, swollen in the middle. t. 191. *Wight* Ic. t. 1261.

In the grass of the downs, coming up after the first rains.

Nilgiris: on the downs Ootacamund to Pykara flowering May or July. *Bourne* 4780, 4782.

Gen. Dist. Also on Anamalais (*Beddome*). Not seen on Pulneys.

Ceropegia spheananantha *Wight and Arnott, Wall. Cat.* 8138! and *Wight's Herb. Prop.* 1513!; *F.B.I.* as *C. elegans* *Wall.*, iv 68. L 10 (*C. elegans* *Wall.*, *Cat.* 8135!).

Stem very slender running in grass. Leaves $1\frac{1}{4}$ by $\frac{1}{2}$ ($\frac{1}{3}$ to $\frac{5}{8}$) inch, lanceolate or ovate-lanceolate, acute or shortly acuminate, glabrous: stalk $\frac{1}{4}$ inch. Flowers solitary, or pedicelled two or three together, on axillary peduncles of $\frac{1}{4}$ inch. Sepals linear, $\frac{1}{8}$ inch, green. Corolla 1 to $1\frac{1}{4}$ inches; crown hemispheric,

broader than the base, green blotched with dark purple; its lobes ciliate with dark purple hairs: junction of the tube and basal part also hairy. Coronal lobes ten, linear clavate: inner processes nearly or quite as long as them, linear, glabrous (fifteen linear structures in all). Follicles '2 to 9 inches, very slender, terete: seed usually $\frac{1}{2}$ inch, linear, convex on one face, deeply grooved on the other.' Wight Ic. t. 1265.

Nilgiris: Kotagiri. Pulneys: below Kodaikanal at Shembaganur. *Fyson* 1906.

Gen. Dist. of "*C. elegans* Wall." in *F.B.I.*: "Malabar and Travancore mountains from Nilgiris to Ceylon."

I find in my specimens the coronal lobes as long as the five inner processes. Wallich in *Bot. Mag.* t. 3015, where the species *C. elegans* was first described, shows them shorter. His Cat. 8135, the type plant, appears to be hardly the same as his Cat. 8138, nor as Wight's *Herb. Prop.* 1513, which are the types of *C. sphenanantha* W. & A. The latter is therefore I think a distinct species, though reduced tentatively in *F.B.I.*

***Ceropegia intermedia* Wight; *F.B.I.* iv 71, L 19.** Stem slender but stouter than in *C. sphenanantha*. Leaf-stalk $\frac{1}{2}$ inch: blade 2 to $2\frac{1}{2}$ by $\frac{1}{2}$ to $\frac{3}{4}$ inch, lanceolate, acute at both ends. Flowers in axillary irregular umbels: peduncle 1 inch: pedicels $\frac{1}{2}$ inch, very slender. Corolla tube 1 inch: lobes $\frac{1}{2}$ inch or less forming a conical crown. Coronal lobes short or absent: inner processes five, long ($1\frac{1}{12}$ inch), dilated upwards.

Pulneys: on the slopes above Shembaganur, and in that valley, Poombari; flowering in June. *Fyson* 564, 1917. *Bourne* 329, 1153, 1602.

Gen. Dist. Ceylon and Courtallum (*Wight*); Anamalais (*Beddome*).

***Ceropegia thwaitesii* Hook.; *F.B.I.* iv 71, L 20.** Stem much as in *C. intermedia* Wight, but flowers much larger up to $2\frac{1}{2}$ inches. Follicles 8 to 9 inches.

Pulneys near Kodaikanal. *Bourne* 83.

Gen. Dist. Travancore, Ceylon.

LOGANIACEÆ.

Leaves opposite; flowers perfectly regular. Sepals, corolla lobes, and stamens four or five. Ovary superior, two-celled. Fruit a berry or dry and septicidal. Trees, shrubs or herbs.

Species about 400.

Two species of *Buddleia* are cultivated in English gardens. Strychnine was prepared originally from the fruit of *Strychnos nux-vomica*.

GARDNERIA.

F.B.I. 96 VIII.

A genus of two or three species or perhaps one only, natives of India and Japan.

Gardneria ovata Wallich, *Cat.* 816!; *F.B.I.* iv 93, VIII 1. A. very common woody climber, with yellow waxy flowers in the centre of which stands a hard cone of anthers; and brilliant red berries.

Tall climber, stem round, smooth, rather stiff, about $\frac{1}{6}$ inch thick. Leaves opposite connected by a line across the axis: stalk $\frac{3}{4}$ inch: blade 3 by $1\frac{1}{2}$ to 4 by $2\frac{1}{2}$ inches, broadly elliptic or obovate, acute, coriaceous, with entire waved margin, and veins impressed on the upper side. Flowers in cymes of three-peduncled in the leaf-axils: peduncles $\frac{1}{2}$ to $\frac{3}{4}$ inch: pedicels as long, with two minute bracteoles half way up: buds $\frac{1}{5}$ by $\frac{1}{6}$ inch. Calyx small, deeply lobed. Corolla rotate, the tube very short: petals five, $\frac{1}{5}$ by $\frac{1}{8}$ inch, yellow, waxy and thick, reflexed; in bud valvate. Stamens five, attached to the corolla tube, but anthers nearly sessile, opening inwards and connivent to form a hard cone conspicuous in the centre of the flower. Berry $\frac{1}{4}$ inch, surmounted by the $\frac{1}{16}$ -inch style, two-celled, and two-seeded. Seed compressed parallel to the division wall, t. 192. Wight Ic. t. 1313.

On shrubs and trees in sholas, very common on the Nilgiri plateau, flowering in April and May. *Fyson* 2097, 2540. *Bourne* 224.

Gen. Dist. Also Khasi hills.

The species was founded on a Nepal plant and the type sheet, Wallich Cat. 816, from Sylhet, has larger more acuminate leaves and large panicles up to 6 inches long, with ten pairs of three-flowered cymes: but it has also in some leaf-axils only one such cyme, as seems with rare exceptions to be the case with the Nilgiri examples.

GENTIANACEÆ.

Herbs with opposite entire glabrous leaves and perfectly regular flowers of five sepals, corolla lobes, and stamens; but characterised by the petals being in bud twisted over each other to the right, and the ovary having two parietal placentas (which do not as a rule meet making it two-celled) and ripening to a many-seeded capsule opening in two valves.

Species 550, all over the globe, mostly on mountains.

- | | | | |
|---|---|---|-------------------|
| a | { | Petals pale blue, each with a small scale at the base . . . | p. 290. SWERTIA. |
| | | Petals pinkish, spurred behind . . . | p. 291. HALENIA. |
| | | Flowers bright or deep blue | b |
| b | { | Corolla folded and twisted: small herb | p. 290. GENTIANA. |
| | | Petals twisted, not folded: tall herb . . . | p. 288. EXACUM. |

EXACUM.

F.B.I. 97 II.

Characters as above for the family, but ovary completely divided into two cells and corolla deep blue.

Species 20 mostly in India.

Stem winged: leaves 1 to 2 inches . . . E. wightianum.
 Stem not winged: leaves 2 to 5 inches . . . E. atropurpureum.

Exacum atropurpureum *Beddome, var anamallayanum*; *F.B.I.* iv 97, II 7.

Stem smooth, four-angled but not winged. Leaves 1 to 2 inches by $\frac{7}{8}$ to $1\frac{1}{4}$ inches, broadly ovate or

oblong-elliptic : base clasping : apex blunt or with small cuspidate point : margin thickened : nerves three strong from the base and an outer fainter pair. Flowering part decussately branched, with flowers pedicelled in the uppermost axils on stalks of $\frac{1}{2}$ inch. Calyx $\frac{1}{2}$ inch, strongly winged : lobes triangular equal to the tube. Corolla $2\frac{1}{2}$ inches, deep rich blue : lobes oblong-obovate cuspidate : tube very short. Anthers $\frac{1}{4}$ inch, attached firmly at their bases narrowed upwards. Fruit globose $\frac{1}{3}$ inch, two-celled with many seeds, opening by two opposite slits and surrounded by the persistent winged calyx.

Pulneys : on the downs in the deeper water channels, flowering June. Not on Nilgiris. *Fyson* 1903. *Bourne* 321, 1609.

Gen. Dist. Also Anamalais and Malabar. The type species has the leaves rounder and without margin, and occurs also in Quilon (*Wight*).

Exacum wightianum *Arnott*; *F.B.I.* iv 97, II 9; Giant Field Gentian.

Stem square, with wings $\frac{1}{16}$ inch broad decurrent from the leaf-margins, glabrous 1 to 3 feet high, branched. Leaves 2 to 5 inches, lanceolate acute narrowed at the base to a broad $\frac{1}{4}$ -inch stalk : nerves three strong with another fainter pair outside near the margin. Flowers in the upper axils. Stalks $\frac{3}{4}$ inch erect in flower, longer and curved down in fruit. Calyx divided to the base, the sepals $\frac{1}{2}$ inch, with a wing down the back $\frac{1}{8}$ to $\frac{1}{6}$ inch wide. Corolla lobes 1 inch, ovate or oblong, contracted to the mouth of the short roundish tube. Stamens $\frac{1}{5}$ to $\frac{1}{4}$ inch, not much narrowed to the top, and 'with a minute papilla on the connective behind.' Fruit egg-shaped, $\frac{1}{2}$ inch.

On the open downs. Nilgiris : Coonoor. Pulneys at 7,000 feet near Kodaikanal and below. *Fyson* 404, 1133, 3043. *Bourne* 438, 1608, 2793, Coonoor.

GENTIANA.

F.B.I. 97 IX.

Herbs, with the characters of the family, often small. Distinguished by the corolla lobes being in bud folded inwards and then twisted, the tube not very short, with the stamens attached to it, and the ovary one-celled (placentas not meeting).

Species about 300, chiefly on the mountains of the Old World, a few on the Andes of South America and in New Zealand and Australia. Well known in Europe for their brilliant blue flowers. *Ger. Enziane.*

Gentiana quadrifaria Bl., *var zeylanica*; (*G. pedicellata* Wall., *var wightii* Kurz); *F.B.I.* iv III, IX 12.

Tap root strong. Radical leaves in a rosette, obovate, 1 by $\frac{1}{3}$ inch, with numerous stems in their axils, bearing $\frac{1}{4}$ inch ovate or lanceolate leaves, and solitary terminal flowers. Bud $\frac{1}{2}$ inch long. Corolla $\frac{3}{4}$ inch, bright blue. Fruit a 'capsule $\frac{1}{5}$ by $\frac{1}{8}$ to $\frac{1}{6}$ inch. Seeds globose or obovoid, trigonous, smooth' (*Clarke*). t. 193.

Common in grass on the downs especially at the lower limits of an area, e.g., Kotagiri, Coonoor. *Fyson* 2647, 2921. *Bourne* 5.

Gen. Dist. Of *G. quadrifaria* Bl., Himalayas from Kashmir to Bhotan, Khasia, Ceylon, Burma, Java, China.

Kurz now has separated the Indian form placed in *G. quadrifaria* Bl. in *F.B.I.*, and restored Wallich's name *pedicellata*. I have not been able to see his paper, nor Blume's type plant, and am unable to express any opinion about this.

SWERTIA.

F.B.I. 97 XII

Herbs with the general characteristics of the family (p. 281) and characterised by the tube of the corolla being very short and lobes (petals) overlapping to the right, and each with a small depression at the base, more or less covered by a hairy scale (a honey gland).

Species 50, Europe, Asia, Africa, chiefly on the mountains.

Swertia corymbosa Wight; *F.B.I.* iv 126, XII 17. Annual or perennial: lower leaves more crowded than

the upper, and often soon falling. Stem 6 to 18 inches, roundish, but with four ridges decurrent from the edges of the leaves, sparingly branched except in the flowering region. Leaves obovate, sessile, acute or not, strongly three-nerved: lower 1 by $\frac{1}{4}$ inch, upper narrower and shorter. Flowering branches in the upper axils, two to five pairs, often branched again more than once so as to form a terminal cymose corymb 3 to 8 inches across: uppermost divisions short so that the flowers are crowded in umbel-like manner. Sepals narrow, $\frac{1}{4}$ to $\frac{1}{3}$ inch. Petals longer, white or very pale blue with darker veins: pocket at the base of each covered by a scale. Stamens with broad bases attached to the very short corolla tube. t. 194. Wight Ic. tt. 1329, 1330.

On the open downs, very common after the first rains. *Fyson* 2010, 2156, 437, 371. *Bourne* 310.

Three varieties are given in F.B.I., but I am unable to distinguish them. Difference in the size of the plants and the length of the internodes, making the corymbs contracted or open, appear to be due rather to situation and growth than to an inherited difference. There may be some difference between my Nilgiri and my Pulney specimens, but I am unable to define it with any confidence.

HALENIA.

F.B.I. 97 XIII.

Branched and leafy herbs with the characteristics of the family and distinguished from all others by a short spur behind and at the base of each petal (really an enlarged honey gland *cf.* SWERTIA), and from SWERTIA also by the petals overlapping to the left. Ovary one-celled.

Species 25 to 30 on the mountains of Asia and America.

Halenia perrottetii Gr.; F.B.I. iv 130, XIII 2. Stem slender, annual, glabrous, obscurely winged. Leaves ovate, about 1 by $\frac{1}{2}$ inch, with three main basal nerves and an outer fainter pair. Flowers at the ends or near the ends of the quite numerous branches. Sepals $\frac{1}{5}$ inch, narrowly obovate-obtuse. Petals $\frac{1}{3}$ inch, more or

less erect and connivent: spur $\frac{1}{8}$ to $\frac{1}{6}$ inch, curved upwards, obtuse. Ovary $\frac{1}{8}$ inch, narrowed upwards into the $\frac{1}{8}$ -inch style. "Seeds $\frac{1}{24}$ inch" (*Clarke*).

In shady places, by sholas, etc. Flowers in autumn months. Pulneys: at 7,500 feet on the downs. Nilgiris: flowers in November. *Fyson* 401, 1228. *Bourne* 1614, 5201.

I am unable to distinguish this from *H. elliptica* *Don*, a Himalayan plant, but *Clarke* in *F.B.I.* says style longer and seeds much smaller.

BORAGINACEÆ.

Herbs (shrubs or trees) hispid or scabrid, with alternate, mostly entire, simple leaves and small perfectly regular flowers arranged in two rows along one side of slender forked spikes (*scorpioid cymes*), peculiar in being curled up backwards, crozier-wise, in bud with the flowers facing outwards, and upwards as they open, and in having no bracts, or a bract opposite to, not subtending, each short pedicel. Flowers with five-toothed calyx: five-lobed monopetalous corolla, imbricate in bud, and with the throat of the tube more or less closed with scales: five stamens attached to the corolla tube and alternating with the lobes: and a two-celled ovary with two ovules in each cell, and peculiar in being as a rule deeply divided into four lobes (so that the style rises up in the centre between them), each of which becomes in fruit a *nutlet* containing an erect seed: but in some genera the ovary only slightly notched in two lobes (*as Heliotrope*) or entire and the fruit fleshy.

Species about 1,200 all over the world.

In Europe the tribe BORAGINACEÆ (with the fruit of four nutlets) is well represented: e.g. ANCHUSA, MYOSOTIS, LITHOSPERMUM, CYNOGLOSSUM.

CYNOGLOSSUM.

F.B.I. 100 X.

Houndstongue.

Herbs with the characteristics of the BORAGINACEÆ (see above) and distinguished by the nutlets being extended

downwards below the point of attachment (so that the scar is near the top) and being covered with short hooked spines.

Species 60, in temperate and sub-tropical climates.

Cynoglossum furcatum Wall., *Cat.* 919!; *F.B.I.* iv 155, X 1; Houndstongue. Stem 1 to 2½ feet. Leaves 2 by ½ inch; lower larger to 4 inches, upper smaller; hardly stalked, lanceolate or elliptic, acute. Spikes several together terminating the stem and branches, curled back in bud and in flower short (like a Forget-me-not), but in fruit lengthened to 6 or 8 inches; diverging from the stem at about half a right angle. Corolla rotate, blue or pink; lobes five, each with a basal emarginate or two-lobed scale. Fruits at intervals of ½ to 1 inch, facing downwards: sepals ⅛ inch very obtuse, ciliate: nutlets ⅛ inch, covered all over with hooked spines. t. 195.

Pulneys: on the open downs, flowering May and June. Nilgiris and Anamalais, down to much lower levels. *Fyson* 298.

Gen. Dist. Mountains of India.

Owing to the lengthening of the spikes as the nutlets mature the flowering and fruiting appearance of the plant are very different.

I find two forms which may possibly be varieties.

a leaves elliptic quite entire softly hairy. This is possibly the form Clarke in *F.B.I.* refers to as common on the Nilgiris Wall. 919 (Bababoodun, Nepal). *Fyson* 298. *Bourne* 7, 2975.

b leaves obscurely crenulate, scabrid with hairs on tuberculate bases. *Fyson* 1843. Possibly Clarke's *var lanceolata*, but not Wallich's *Cat.* 919.

CONVOLVULACEÆ. § *Convolvuleæ*.

Twiners, chiefly characterised by the funnel-shaped lobeless corolla, which in bud is folded in along five lines and then twisted so that when it is open the five areas exposed in bud are of a darker colour. Stamens five, attached to the base of the corolla with oblong anthers dehiscing by slits. Ovary superior of two carpels,

two or four-celled. Style with undivided or divided, globular or oblong stigma (important for distinguishing the genera). Fruit usually a thin-walled capsule, but also a berry. Leaves always alternate.

Species about 700, mostly in the warmer regions. The genera are so much alike in appearance that their distinction can often be made only by careful examination of the fruit, stigmas, and smaller characteristics.

ARGYREIA.

F.B.I. 101 III.

Flowers in cymes peduncled in the leaf-axils; stigma globular undivided; ovary four-celled; fruit fleshy-indehiscent.

Species about 30, nearly all in India or the Malay Archipelago.

Very similar in general appearance to *CONVOLVULUS* the common European genus; but differs from it in the flowers being in cymes not solitary, and from both it and *IPOMÆA*, the common genus of the plains, in the ovary being four-celled.

Argyreia hirsuta *Arnott*; *F.B.I.* iv 189, III 18. A strong climber, shaggy with silvery hairs on all the green parts. Leaf-stalks 2 inches: blades 4 by 3 inches, ovate with straight or slightly cordate base. Flowering branches (peduncles) stout, 4 to 7 inches, cymosely forked at the top with short branches so that the flowers are bunched: bracts oblanceolate or oblong, persistent, the outer one often stalked and leaf-like. Sepals linear. Corolla $2\frac{1}{2}$ by 2 inches, pale purple with deep purple centre. t. 196. Wight Ic. t. 891 (*Rivea*).

Nilgiris: Kotagiri, 6,500 feet. Coonoor, etc., flowering May and after. Pulneys: 5,500 feet, etc. Not at high levels. *Fyson* 1775, 1789. *Bourne* 187.

Gen. Dist. These hills only and Ceylon as *var coacta*, but very closely allied to other species of South India.

Various species of *CONVOLVULUS* (with two linear stigmas and a two-celled ovary) and of *IPOMÆA* (with two globose stigmas and a two-celled ovary) are cultivated in gardens.

SOLANACEÆ.

Herbs or shrubs with leaves alternate, or in the upper parts in unequal pairs, and solitary or cymosely arranged perfectly regular monopetalous flowers. Corolla often lobeless and plaited in bud. Stamens five attached to it. Ovary of two carpels, with numerous ovules on peltate placentas. Fruit a many-seeded berry or capsule. Distinguished from other similar families by the partition wall (united placentas) of the ovary not reaching quite to the top, the seeds round and very thin (flat discs) and the anthers usually large and opening by terminal pores.

Species about 1,500 in the warmer parts of the whole world, but more especially South America.

The family is divided into four sub-orders, which differ chiefly in the fruit and the folding of the corolla. Common examples of these are—

I. SOLANUM Potato, Brinjal; LYCOPERSICUM Tomato; CAPSICUM Chili; PHYSALIS Cape Gooseberry.

II. LYCIUM Snowberry, a shrub of English gardens; ATROPA Belladonna.

III. DATURA Thorn-apple.

IV. NICOTIANA Tobacco.

- | | | |
|-----|--|-----------|
| a { | Fruit a berry enclosed in a large inflated calyx . . . | b |
| | Fruit a berry, not enclosed; leaves simple; corolla flat . . | |
| | SOLANUM, | |
| b { | Fruit a prickly capsule; corolla funnel-shaped. | DATURA. |
| | Flowers blue, calyx five-partite (Wintercherry). | NICANDRA. |
| | Flowers white with purple spots, calyx only shortly lobed
(Cape Gooseberry) | PHYSALIS. |

SOLANUM.

F.B.I. 102 I.

Potato, Brinjal.

Herbs or climbing plants with the characteristics given above for the family, but the fruit a berry, the corolla with short tube and nearly flat (rotate) limb, folded in bud, anthers large on very short stalks, and

opening by terminal pores. (*Lycopersicum*, tomato, is very similar but has pinnate leaves.)

Species perhaps 1,000 in tropical and sub-tropical regions and especially in America.

The ordinary (not the 'Sweet') potato is a tuberous enlargement of an underground branch, its 'eyes' being undeveloped buds (from which the new shoots arise when a tuber or a portion of it is planted). It was introduced into Europe from South America. The Brinjal or Egg plant is the fruit (berry) of *S. melongena*.

***Solanum denticulatum* Blume, var *gouakai*; F.B.I. iv 232, I 10 var.** Stem smooth or pubescent, without prickles, $\frac{1}{6}$ inch, thick. Leaf-stalk $\frac{1}{2}$ to 1 inch; blade 2 to 4 inches, ovate, acute or acuminate, narrowed to the stalk, with a few large coarse teeth in the further half, nearly or quite glabrous. Flowers several together in a leaf-axil; stalk $\frac{1}{2}$ to $\frac{3}{4}$ inch. Corolla $\frac{1}{2}$ inch, white. Berry $\frac{1}{3}$ inch, red, glabrous. Wight Ic. t. 1397.

In shady places. Pulneys in woods below Kodaikanal at 6,500 feet and below (Glen falls), flowering June. Rare at the higher levels. Nilgiris: Kotagiri. *Fyson* 506, 380, 3057. *Bourne* 2681, 1131, 2808.

Gen. Dist. South India and Ceylon.

The species was founded by Blume on the Java plant, which has entire leaves, more than twice as long as broad. Our plant was originally described as a distinct species - *S. gouakai*, by Dunal.

***Solanum indicum* Linn., var *multiflora* Wight; F.B.I. iv 235, I 20 var.** A low bush; stem much branched, stout, purplish but covered with stellate, woolly, tomentum, armed, as also the leaves on the veins, with stout, flat (compressed), thorns, up to $\frac{1}{2}$ inch high, and $\frac{1}{5}$ by $\frac{1}{8}$ inch, broad at the base. Leaves 3 inches, ovate, with triangular lobes; densely tomentose underneath, thinly so above. Flowers in raceme-like double rows on stout branches of short, dense, panicles, which are stellately woolly and also armed with small spines. Pedicel $\frac{1}{10}$ inch, thick, spiny; in fruit $\frac{1}{3}$ inch, gradually thickening to the spreading sepals, armed with $\frac{1}{5}$ inch or longer slender spines. Sepals $\frac{1}{10}$ inch, tomentose, linear.

Petals $\frac{1}{5}$ inch, triangular acute, tomentose and pilose on the backs, smooth inside, violet. Anthers not as long, opening by two pores at the tops: filaments very short. Style slightly longer, stellately hairy, except at the end; stigma terminal, small. Fruits crowded, the pedicels decurved so that all face downwards, when green with a few hairs, becoming later a rich orange, and nearly smooth, but with a few stellate hairs, later dark purple, $\frac{1}{4}$ inch diameter. Seeds $\frac{1}{6}$ by $\frac{1}{8}$ inch flat, covered thickly by very small warts. t. 197. Wight Ic. t. 1400 (*S. ferox-minus*).

In the open. Nilgiris: on the Ootacamund downs common, especially towards Pykara and below. Pulneys: down to 5,500 feet. *Fyson* 3058, 2739. *Bourne* 350.

Solanum indicum Linn.; *F.B.I.* iv 235, I 20. Leaves less spiny than *var* multiflora; flowers few on longer pedicels. At lower levels only.

Fyson 50, 1937, 1431.

Gen. Dist. Throughout India and across to Java, China and the Philippines.

PHYSALIS.

F.B.I. 102 II.

Herbs with solitary axillary flowers of the SOLANUM type, but anthers opening by longitudinal slits (not pores) and berry enclosed in a thin papery bag (the enlarged calyx).

Species perhaps 30, natives chiefly of America and more especially Mexico and North America; but a few widely distributed over the warmer parts of the world.

Physalis peruviana Linn.; *F.B.I.* iv 238, II 2; Cape Gooseberry. Leaf-stalk 1 inch; blade ovate-cordate, $2\frac{1}{2}$ by 2 inches. Flower-stalk $\frac{1}{2}$ inch. Corolla white with purplish spots. Calyx in fruit $1\frac{1}{2}$ inches long.

Cultivated and now in places run wild. A native of South America, from which it was introduced into England in 1772.

NICANDRA.

F.B.I. 102 III.*

Species one only, native of Peru. Named after Nicander of Coloption who lived in the second century.

Nicandra physaloides *Gartn.* ; *F.B.I.* iv 240, III * 1 ; Winter-cherry. Weak stemmed and often climbing. Leaves irregularly toothed, glabrous. Flowers small, blue. Fruit surrounded by five much enlarged strongly veined sepals, free nearly to the base and cordate.

Not wild but occasionally found as an escape. Pulneys : Kodaikanal near Pambar House.

DATURA.

F.B.I. 102 VII.

Thorn-apple.

Species about ten in temperate and tropical regions. On the plains two occur—*D. stramonium* with, usually white, corolla 3 to 6 inches long bell-shaped with linear teeth ; and *D. fastuosa* with, usually purple, corolla 7 by 5 inches at the mouth and short teeth. The one at Pambar House, Kodaikanal, I believe to be

Datura suaveolens *H.B. & K.* ; VII 4. A shrub growing to 10 or 15 feet, with elliptical oblong, entire, glabrous leaves and large bell-shaped flowers 8 by 6 inches, white with strong sickly odour at night, folded inwards along five lines in bud.

A native of Mexico introduced into England in 1733.

Photographs of a bank of this shrub near Pambar House I have seen offered for sale at Kodaikanal as of a bank of " Kodai Lilies " ! The Lily has six separate petals always.

SCROPHULARIACEÆ.

Herbs or shrubs with the lower leaves at least usually opposite. Flowers monopetalous, and more or less irregular, often two-lipped. Stamens four with sometimes a rudimentary fifth, or two only. Ovary superior of two cells, fruit a many-seeded capsule.

Species about 2,000 found all over the world.

This large family is divided into a number of tribes collected into three series :—

Series A.—Leaves all alternate: corolla with two upper lobes outside the others in bud, e.g., *VERBASCUM* Mullein, *CELSIA*.

Series B.—Leaves at least the lower opposite: corolla with two upper lobes (or lip) outside in bud, e.g., *LINARIA* Toadflax, *ANTIRRHINUM* Snapdragon, *MIMULUS* Monkey-flower, *ILYSANTHES*.

Series C.—Corolla with the lower or a lateral lobe outside in bud, e.g., *VERONICA* Speedwell, *SCOPARIA*, *STRIGA*, *SOPUBIA*, *EUPHRASIA* Eyebright, *BARTSIA*, *PEDICULARIS* Red Rattle, *LATHRÆA*.

- | | | | |
|---|---|---|------------------------------|
| a | { | Leaves all alternate | b |
| | { | Leaves opposite of slender segments: | p. 303. <i>SOPUBIA</i> . |
| b | { | Stems erect | c |
| | { | Stems weak and decumbent or creeping | e |
| | { | Flowers tubular hanging in a tall spike, Foxglove | p. 301. <i>DIGITALIS</i> . |
| c | { | Flowers erect | d |
| | { | Leaves linear: corolla tube $\frac{1}{2}$ inch narrow, bent; lower lip spreading yellow | p. 302. <i>STRIGA</i> . |
| d | { | Leaves lobed or deeply crenulate: flowers 1 inch, pink compressed laterally. Red Rattle. | p. 305. <i>PEDICULARIS</i> . |
| | { | Flowers yellow; lips bag-shaped mouth closed | p. 299. <i>CALCEOLARIA</i> . |
| e | { | Flowers blue flat: capsule two-lobed | p. 301. <i>VERONICA</i> . |
| | { | Leaves entire, corolla distinctly two-lipped | p. 300. <i>ILLYSANTHES</i> . |

CALCEOLARIA.

103 III.*

Well-known garden plants distinguished from all others by the corolla having a short tube and two bag-shaped lips with closed mouth.

Species 120 natives of western America especially of the Andes from Magellan to Columbia and Mexico, but with two in New Zealand.

Calceolaria mexicana *Benth*am; III* 1; common Slipper Flower. A naturalised garden plant, native of Mexico, Guatemala and Costa Rica.

Stems round, very flaccid and almost translucent, smooth, thickly covered, as also the leaf-stalks and margins, with glandular hairs. Leaves all opposite: petioles 1 inch joined across the axis at the base: blades pinnatisect into five to seven lobes; these again coarsely and irregularly toothed, covered on the upper side with white

glistening hairs, pale on the lower; veins and margins glandular. Flowers on nearly terminal, but lateral and axillary, pedicels; all green parts glandular and sticky. Sepals ovate, $\frac{1}{5}$ to $\frac{1}{4}$ inch, occasionally toothed. Corolla lemon-yellow; lower lip in the form of a bag nearly as long as broad, variable in size, but usually about $\frac{3}{4}$ inch upper lip hood-shaped, glandular and very hairy inside. Stamens two, attached closely to the inside of the hood, each with one half anther inside, and a club-shaped part projecting out of the mouth. Capsule a long oval, exceeding the calyx.

On moist shady banks and by the edges of sholas; common in and near the hill-stations. *Fyson* 2005, 488. *Bourne* 200.

Honey is secreted by a small greenish gland at the inner end of the upper side of the lower lip, but the entrance to the flower is closed except to insects willing and able to push in by depressing the lower lip. The anthers are protected from rain and waste inside the hood, but each is at one end of a lever hinged to the inside of the hood and projecting at the other end well outside the mouth. When an insect, such as a bee, forces its head into the space between the two lips it of necessity comes into contact with these two sterile ends of the connectives, and pushing them down brings out the anthers against the back of its head. When it leaves the flower the anthers are released and spring back again inside the hood and the mouth is closed. The protection of the pollen is therefore very perfect. Autogamy would occur by the fall of the corolla. *Cf.* Kunth, *Flower Pollination*, vol. II, page 165, for *C. pinnata*.

ILLYSANTHES. F.B.I. 103 XXV.

Annual glabrous herbs. Leaves opposite, entire or nearly so. Flowers two-lipped. Sepals narrow. Stamens two. Capsule not much longer than broad.

Species 10 to 15, in India, South Africa, North America and Australia.

Illysanthes hyssopioides Benth.; *F.B.I.* iv 283, XXV
1. A marsh plant. Stem 6 to 10 inches, weak. Leaves $\frac{1}{3}$ by $\frac{1}{8}$ inch, one- or three-nerved, entire. Flower-stalks in the upper axils, $\frac{3}{4}$ to 1 inch, very slender. Sepals

$\frac{1}{6}$ inch. Corolla $\frac{1}{2}$ inch, pale blue. Capsule hardly longer than the sepals, obovoid.

Nilgiris : Pykara in wet places.

Gen. Dist. Deccan, Ceylon, lower hills of India, China.

DIGITALIS.

103 XXXIV.

Foxglove.

Species about 18 in Europe and western and middle Asia.

Digitalis purpurea Linn.; XXXIV * 1; common Foxglove. Stem in flower 2 to 5 feet, erect usually unbranched. Leaves mostly at the base, elliptic ovate, narrowed to the winged stalk, up to 12 by 6 inches, crenate-serrate, rugose; stem leaves similar but smaller, near the flowering region 1 to 2 inches only. Flowers in a tall handsome raceme, dense. Bracts $\frac{1}{2}$ to $\frac{3}{4}$ inch : pedicel $\frac{1}{2}$ inch. Sepals $\frac{1}{3}$ inch. Corolla 2 to $2\frac{1}{2}$ inches tubular, broadening towards the mouth, pink with dark purple spots, hanging with mouth downwards. Stamens four, anthers cohering under the upper side of the corolla. Fruit a capsule, $\frac{5}{8}$ inch, pubescent with jointed glandular hairs, splitting open by an upper and a lower valve. Seeds numerous, reddish brown.

In woods near Ootacamund as a garden-escape. Kodai-kanal. *Fyson* 3059.

A common European plant. *Fr.* Digitate rougeatre. *Ger.* Rothe Fingerhut. Malformations by which two or three flowers at the summit coalesce into one widely open corolla at the top while others lower down on the spike are undeveloped, occasionally occur.

VERONICA.

F.B.I. 103 XXXIX.

Herbs, shrubs or rarely trees with opposite or alternate leaves and flowers in bracteate racemes (or occasionally solitary); distinguished by the corolla tube very short and lobes flat, a lateral one exterior in bud, the stamens two only, and the fruit a two-valved capsule often notched at the top.

Species 200, in temperate and cold regions of the whole world, widely dispersed.

Stems prostrate: leaves alternate: flowers pedicelled in the leaf-axils . . . common Speedwell. *V. agrestis*.

Stem erect: leaves opposite: flowers in axillary bracteate spikes *V. javanica*.

***Veronica agrestis* Linn.; F.B.I. iv 294, XXXIX 9;**
common or Corn Speedwell.

A tender prostrate plant; pubescent with jointed hairs, some glandular. Leaves $\frac{1}{2}$ to $\frac{3}{4}$ inch, shortly stalked, ovate, abrupt or cordate at the base, coarsely serrate. Pedicels axillary $\frac{1}{2}$ to 1 inch, very slender. Sepals ovate-elliptic, $\frac{1}{8}$ inch, fringed with simple and a few glandular hairs. Corolla blue. Fruit of two divergent lobes, one net-veined when ripe and slightly keeled. t. 198.

Road-sides. Ootacamund: Lovedale. *Fyson* 1453, 1450, 2008. *Bourne* 705. There appears to me to be no difference between this and the European plant.

Gen. Dist. Of species and varieties—widely, all over Europe and northern Asia to Japan, Himalayas, etc. *Fr.* Velvete sauvege, *Ger.* Ackerohrenpreis.

***Veronica javanica* Bl.; F.B.I. iv 296, XXXIX 15;**
Java Speedwell. Tender, annual herb. Stems numerous erect. Leaves opposite, shortly stalked, $\frac{3}{4}$ to $1\frac{1}{4}$ by $\frac{1}{2}$ to $\frac{3}{4}$ inch, deltoid with abrupt nearly horizontal base, coarsely serrate, pubescent. Spikes of flowers axillary, 2 to 3 inches: bracts $\frac{1}{4}$ inch, oblanceolate: pedicel $\frac{1}{8}$ inch. Corolla $\frac{1}{4}$ inch, capsule $\frac{1}{2}$ to $\frac{1}{8}$ inch, not longer than the sepals. Style $\frac{1}{30}$ inch.

Nilgiris: Lovedale (collected by Miss Edwards in November). Pulneys: Kodaikanal (*Bourne*) and below. *Fyson* 1454. *Bourne* 874, 1683.

Gen. Dist. Java, Himalayas, Loochoo islands. This appears to be the first record of this species in South India.

STRIGA.

F.B.I. 103 XLII.

Small herbs with slender stem and narrow leaves, rough with hard short hairs, and drying black, Flowers

in the axils of the upper leaves. Calyx tubular, more or less deeply divided into its five parts. Corolla with a slender tube bent about half way, a large flat lower lip, and small upper one. Stamens four, not exserted; anthers one-celled. Capsule opening in two valves which separate from the placentas. Seeds very numerous with rough coat.

Species about 20, in the better parts of the world.

Striga lutea Lour.; *F.B.I.* iv 299, XLII 3. A small herb common in the grass of open downs with short, narrow leaves and sulphur yellow flowers.

Stem unbranched, 3 to 4 inches, slender, pubescent, grooved. Leaves sub-opposite, linear, $\frac{1}{2}$ to $\frac{3}{4}$ inch, erect and usually curved towards the axis. Flowers axillary. Calyx-tube $\frac{1}{4}$ inch, ribbed; teeth $\frac{1}{12}$ inch. Corolla tube exserted $\frac{1}{6}$ inch above the calyx, contracted and abruptly incurved just below the limb, which spreads out flat and nearly horizontal with three lower lobes wedge-shaped, $\frac{1}{5}$ by $\frac{1}{8}$ inch at the broader end, and two upper lobes $\frac{1}{6}$ by $\frac{1}{8}$ inch, minutely crenulate, arching at the base over the minute mouth. Capsule sessile, not as long as the calyx, brown, opening by two valves; dry calyx chocolate coloured with white hairs. *Fyson. Bourne* 41.

A parasite by its roots on roots of small herbs. Very common on the open downs and at lower levels.

Gen. Dist. All over south and western India, mainland of south-east Asia and tropical and South Africa, Madagascar.

Though it is so very common, I found myself at Kew without any specimens of my own collecting from these districts and cannot therefore be confident that our high level plants are this species.

SOPUBIA.

F.B.I. 103 XLV.

Herbs with opposite narrow or deeply divided leaves and flowers with one of the lower lobes exterior in bud;

anther cells unequal, one stipulate and empty; stigma thickened; seeds with lax skin.

Species under 10, natives of South Africa, India, Malaya, and Australia.

Corolla longer than broad, pink *S. delphinifolia*.

Corolla broader than deep, yellow *S. trifida*.

***Sopubia delphinifolia* G. Don; F.B.I. iv 302, XLV 1.** An erect herb. Upper leaves simple, $\frac{1}{2}$ inch; lower with rachis of $1\frac{1}{2}$ to 2 inches and two or three pairs of hardly broader, filiform, segments. Flowers axillary, stalks $\frac{1}{6}$ inch. Calyx-tube $\frac{1}{8}$ to $\frac{1}{6}$ inch: teeth $\frac{1}{4}$ inch acute. Corolla pink, tubular, narrow below, inflated above; lobes $\frac{1}{8}$ inch, rounded, imbricate. Stamens four, the middle and upper pair longer. Anther-lobes attached at their summits to the filament, free below. Capsule oblong, seeds oblong rounded at both ends, striated. t. 199.

In the open, among grass, a root parasite.

Pulneys: on the downs high above Kodaikanal. Nilgiris: near Optacamund, etc. *Fyson* 539.* *Bourne* 115.

Gen. Dist. Mysore, Carnatic, Travancore, Canara and, generally, uplands of South India, Bundelkund, Behar, Ceylon.

***Sopubia trifida* Ham.; F.B.I. iv 302, XLV 2.** An erect herb. Upper leaves $\frac{1}{2}$ to $\frac{3}{4}$ inch, simple; lower 1 to $1\frac{1}{2}$ inches, with one pair of narrow but hardly filiform segments. Flowers one or more in a leaf-axil; pedicels $\frac{1}{2}$ inch. Calyx $\frac{1}{5}$ inch; lobes shorter than the tube, fringed with hairs. Corolla cup-shaped $\frac{3}{8}$ to $\frac{1}{2}$ inch, creamy-yellow, as broad or broader than deep and bowl-shaped. Capsule egg-shaped or ellipsoid, notched at the top. t. 200.

In the grass of the open hill-side, and in damp places. *Fyson* 456, 1502. *Bourne* 753,* 2838. Pulneys: on the downs flowering from May. Nilgiris: Ootacamund to Avalanche flowering from August.

Gen. Dist. Hills of South India, Ceylon, Siam, China, Philippines.

.PEDICULARIS.

F.B.I. LII.

Perennial herbs with lower leaves usually pinnately lobed or divided, and axillary two-lipped monopetalous flowers, characterised by the calyx being split down the middle of the upper and lower lip, and the upper lip of the corolla high and compressed and so much narrower than the spreading lower. Stamens four, didynamous, with transverse anthers meeting under the upper lip. Capsule compressed ovate or lanceolate, often bent, opening loculicidally. Seeds numerous, of various shapes, with close or loose, smooth or wrinkled skin.

Species 250, in Europe, Asia, and both Americas. *Eng.* Lousewort, Red Rattle; *Ger.* Sumpfläusekraut. Allied to RHINANTHUS Yellow Rattle; *Fr.* Cocote; *Ger.* Klapper groote, Ratelaar.

Pedicularis zeylanica Benth.; *F.B.I.* iv 317, LII 37; Pink Rattle or Nilgiri Lousewort. Stem $1\frac{1}{2}$ to 2 feet green pubescent. Leaves 2 by $\frac{1}{2}$ to $\frac{1}{3}$ inch, or even only 1 by $\frac{1}{6}$ inch, oblanceolate-oblong, cut about half way to the midrib into narrow rounded lobes, which are again lobed, and often also curled downwards, reminding one of some ferns, dull grass green in colour, pubescent. Flowers in the upper axils: pedicels $\frac{1}{8}$ inch. calyx-tube $\frac{1}{3}$ inch, villous, cylindrical with oblique mouth. Corolla pink, exserted $\frac{1}{2}$ to $\frac{3}{4}$ inch beyond the calyx; upper lip arched, compressed, notched; lower spreading forwards, three-lobed; tube short. Stamens four glabrous; anther lobes with acute bases. Capsule $\frac{3}{4}$ inch. t. 201. Wight Ic. t. 1419.

Common in damp places in the open. Pulneys: on the downs below and above Kodaikanal, flowering May to September. Nilgiris: near Ootacamund to Kotagiri. *Fyson* 320, 1073, 1845. *Bourne* 413, 1096,* 5204.

Gen. Dist. Mysore and hills of South India and Ceylon.

Except for being erect and taller this is very like *P. sylvatica* of Europe. *Eng.* Procumbent Lousewort,

Pedicularis perrottetii *Benth.* ; *F.B.I.* iv 317, LII 36.
 Remarkable for the very large white flowers, between 3 to 4 inches long : occurs at avalanche but not I think on the higher levels. t. 202. Wight Ic. t. 1418. *Bourne* 5268.

LENTIBULARIACEÆ.

Principal genus

UTRICULARIA.

F.B.I. 105 I.

Bladderwort.

Small herbs, growing in damp places or in water, and remarkable for having, on the much dissected submerged leaves, small bladders which trap and ultimately digest and absorb small animals. Flower-stem erect, slender, leafless. Calyx two-partite. Corolla of two lips, upper entire or emarginate, lower larger three to six-lobed, with a pointed, curved or straight spur below. Stamens two, with broad filaments. Style short, stigma of two, unequal lobes. Fruit a one-celled globose capsule, with many seeds on a basal placenta.

A large genus of some 150 species scattered over the whole world and in all climates ; in India from the plains of Madras to the top of the Nilgiris, and at least 1,000 feet on the Himalayas of Sikkim.

This wide distribution is characteristic of marsh and water plants, and is due in part to the comparative evenness of the conditions of life, with its smaller ranges of temperature and less risk of dryness in the growing seasons than is the case in dry situations. In Britain there are three species, and three also of *PINGUICULA*, Butterwort, another genus of this family. The Butterworts also feed to a small extent on animal life, by digesting the flies which settle on their sticky leaves. So do a number of other plants, which live in moist places, and it seems as if this is due to the difficulty of getting sufficient nitrogen in an easily assimilable form ; perhaps because such compounds of nitrogen are very soluble in water and readily drain out of soil.

Flowers blue	<i>U. cœrulea.</i>
Flowers purple	<i>U. racemosa.</i>
Flowers yellow	<i>U. wallichiana.</i>

Utricularia cœrulea *Linn.*; *F.B.I.* iv 331, 105, 19;
Blue Bladderwort.

Flowering stem 2 inches, with a few scales: basal simple leaves evanescent: flowers few, sub-terminal. Pedicel $\frac{1}{5}$ inch, pinkish purple. Calyx lobes $2\frac{1}{6}$ inches; lower sometimes minutely toothed; upper pinkish purple. Upper lip of corolla obovate, $\frac{1}{6}$ by $\frac{1}{5}$ inch, finely veined, blue, erect; lower lip much arched in the middle, blue at the sides, lighter but with purple veins in the centre: spur $\frac{1}{4}$ inch, slender, pointing nearly vertically downwards, much the same colour as the upper lip. Bladders on the submerged leaves $\frac{1}{30}$ inch, dark purple. t. 203. Wight Ic. tt. 1573, 1578.

Common in marshy places, flowering May. *Bourne* 17, 1718.*

I have not been able to compare Nilgiri specimens with the Linnæan one and cannot therefore be confident as to the name. But the following manuscript note appears on one of the sheets at Kew:

Utricularia cœrulea *Linn.* in Herb. *Linn.* not of description, are:—

Wall. Cat. .495 'U. humilis' *Heyne*; *Herb. Wight* Ic. t. 1578 'U. pedicellata'; *Thwaites* 2086 'Ceylon'

Var uliginoides:—*Wight Herb. Prop.* 2713 B, 'Pulney', 'uliginosa' *Wight* Ic. t. 1573.

var uliginosa:—*Schmidt* '1884'; bladders up to one-sixteenth inch, all parts broad.

Utricularia wallichiana *Wight*; *F.B.I.* iv 332, 114;
Yellow Bladderwort.

Flowering stem 1 to $1\frac{1}{2}$ inches, very slender, with a few small bracts, but no leaves at the flowering time. Pedicels $\frac{1}{8}$ inch, erect. Calyx lips acute; upper $\frac{1}{8}$ inch; lower $\frac{1}{10}$ inch. Corolla yellow; upper lip acute $\frac{1}{8}$ inch; lower notched at the end, corrugated, with a high arch in the middle and decurved sides. Fruit enclosed in the two, now nearly circular, calyx lips, $\frac{1}{12}$ inch, flat with very thin walls. Seeds small sand-coloured, longitudinally wrinkled in irregular folds. t. 204. Wight Ic. t. 1572, fig. 1.

Marshy places in the open. Nilgiris : near Pykara on the river bank ; Kaity. Pulneys : Kodaikanal down to Machur. *Bourne* 1657.

Gen. Dist. South Indian hills and Ceylon.

Utricularia racemosa Wall. ; *F.B.I.* iv 333, I 17. Scape 3 to 6 inches. Slender. Scales and bracts produced backwards below the point of attachment. Flowers subsessile. Purple.

Kodaikanal, near the lake, at the head of Lidcot valley and Bruce's swamps. *Bourne* 16, 1657,* 1658.

GESNERACEÆ.

Mostly herbs, though some shrubby, with opposite or alternate, often radical leaves. Calyx and corolla typically five-lobed, but stamens two or four only. Corolla mostly two-lipped with the upper lip, or two lobes, inside the others in bud. Ovary one-celled, remarkable for the two large placentas projecting into the cavity on stalks or on a narrower portion, which may divide the ovary incompletely into two cells. Seeds numerous.

Genera about 80, species 800 or 900 in south-east Asia, Polynesia, and tropical America.

In some of the family one only of the two seed-leaves (cotyledons) is developed, and it may increase in size continuously and be the only leaf the plant ever possesses.

ÆSCHYNANTHUS.

F.B.I. 106 I.

Shrubby plants growing on the branches of trees. Leaves opposite, succulent or leathery. Flowers in small stalked bunches at the ends of the branches, with the characters of the family, but distinguished by having four perfect stamens projecting out of the flower, the

seeds borne on the outer, not the ad-axial sides of the placentas, and the pod very long and slender.

Species over 50 in India and Malay region.

Æschynanthus ceylanica Gardner ; F.B.I. iv 340, I 9. Leaves 3 to 4 inches by $\frac{3}{4}$ to 1 inch, narrowed to each end, stalk $\frac{1}{6}$ to $\frac{1}{4}$ inch. Flowers 1 inch. Pod 5 inches by $\frac{1}{6}$ inch.

Pulneys, near and above Kodaikanal in Gundattu and Gundan valley sholas. Bourne 333, 575. Nilgiris: near Pykara, Wight.

KLUGIA.

F.B.I. 106 XV.

Species three in India and Ceylon, one or two in Mexico all very similar in general appearance.

Klugia notoniana A.D.C. ; F.B.I. iv 366, XV 1. A herbaceous plant of moist situations, with thick smooth stems, ear-shaped orbegonia-like leaves and flowers with a very conspicuous deep blue lip hanging down.

Stem up to 3 feet, glabrous, translucent, swollen at the nodes. Roots fibrous. Leaves 4 to 8 inches by $2\frac{1}{2}$ to 5 inches, alternate, shortly stalked, very obliquely ovate, with sinuate or dentate margin, pubescent on both sides, flaccid and soon withering: nerves numerous and curving a little forwards, very regularly, about $\frac{1}{5}$ inch apart. Flowers in terminal racemes: pedicels $\frac{1}{6}$ to $\frac{1}{5}$ inch, horizontal in fruit: bracts minute. Calyx $\frac{1}{4}$ inch with five angles and teeth, winged at the uppermost, dorsal, angle. Corolla tube $\frac{3}{4}$ inch, white: upper lip small and similarly coloured; lower $\frac{3}{4}$ to 1 by $\frac{3}{4}$ inch, hanging down vertically in front, deep rich blue, with yellow towards the mouth. Stamens four. Calyx in fruit pointing downwards. Capsule $\frac{1}{6}$ inch, spherical. Seeds very numerous on three sides of each of two large intruded placentas. Wight Ic. t. 1353.

Pulneys : only in cool places near water, common at 5,500 feet, Silver Cascade, Shembaganur ; but also (rare) on the downs above Kodaikanal. Nilgiris : Coonoor. *Fyson* 421, 3061, *Bourne* 40.

Gen. Dist. South India and Ceylon.

DIDYMOCARPUS. F.B.I. 106 IV.

Didymocarpus tomentosa Wight; F.B.I. iv 353, IV 33; a small herb with Primula-like habit and pale mauve flowers is common on the Kodaikanal ghat just below Shembaganur. t. 205. *Wight* Ic. t. 1349. *Bourne* 193,* 1660, 1163.*

ACANTHACEÆ.

Herbs and shrubs characterised chiefly by swollen nodes, opposite undivided leaves, flowers in spikes with conspicuous bracts and bracteoles, and oblong capsules, from which on dehiscence, the seeds are shot out by their thick springy stalks. Corolla of five lobes, twisted or imbricate in bud; nearly equal or in two lips. Stamens two or four. Ovary surrounded by a honey-secreting disc; stigma two-lobed.

Species 1,600, and genera 134, mostly in the tropics, but some in the Mediterranean region, United South Africa and Australia.

- | | | |
|---|---|--|
| a | { | Corolla lobes nearly equal . . . p. 310. STROBILANTHES. |
| | | Corolla distinctly two-lipped : stamens two b |
| b | { | Filaments white, projecting stiffly out of the widely open corolla p. 314. ANDROGRAPHIS. |
| | | Filaments slender, under the upper lip; anthers white-tailed p. 316. JUSTICIA. |
| | | Spike one-sided; bracts broad, edged with white . p. 318. RUNGIA. |

STROBILANTHES. F.B.I. 109 XVIII.

Large or small shrubs or herbs with opposite leaves and rather large violet or white, seldom yellow, flowers in

heads or spikes. Corolla lobes in bud overlapping each other to the left. Stamens four (or two only fertile), of two lengths, filaments close together at the base. Ovary with two seeds in each cell (four in all).

Species 200, nearly all in Asia and especially on the Western Ghats of South India.

Many of the species are *multiennials*, i.e., the plant flowers once only and then dies down; and on these hills since nearly all the plants of a species flower as a rule in the same season, there is a great outburst of flower once in every few years. Between these years, it is often very difficult to find a single plant in flower.

The genus is remarkable for the variation in the pollen grains of different species and Clarke in Ms. at Kew has proposed dividing the Indian species among four genera, as follows:—

ENDOPOGON *Nees*; stamens two only, pollen grain ellipsoid with twelve to twenty ribs. Species of F.B.I. Nos. 6 and 12 to 20.

GUTZLAFFIA *Harce*; stamens two only, pollen grains with tubercles or spines. Species of F.B.I. Nos. 5, 7, 9—11.

ACANTHOPALE *Clarke*; stamens four, pollen grains with spines or prickles. Species of F.B.I. Nos. 22, 25, 28, 38, 43, 47, 60, 62 to 65, 76.

STROBILANTHES *Blume*, stamens four, pollen grains ellipsoid with twelve to twenty longitudinal ribs. Sp. of F.B.I. 23, 24, 26, 27 and the remainder.

Strobilanthes foliosus *T. Anders.*; *F.B.I.* iv 433, XVIII 12. ENDOPOGON. Stem and branches glabrous, angular. Leaves ovate-acuminate, narrowed to the stalk, $1\frac{1}{2}$ to 3 inches, finely serrate: nerves evenly spaced, arching forwards. Racemes very short and capitate: outer bract leafy embracing the raceme by a dilated base. Corolla with a narrower portion $\frac{3}{4}$ inch, and an upper campanulate part 1 by $\frac{1}{2}$ inch, with rounded lobes. Stamens two. Pollen grains ellipsoid with about twenty longitudinal ribs. Seeds shining, drab-coloured like small pebbles. Wight Sp. Nilg. 171; Ic. t. 1501.

var capitatus. Hairy on the peduncles, inner bracts and younger stems, otherwise similar. Wight Ic. t. 1499 (*Endopogon capitatus*); Sp. Nilg. t. 170.

Nilgiris and Pulney hills on the outskirts of woods 5,000 to 7,000 feet. *Fyson* 1045, 1183. *Bourne* 1137, 1350, 5245,

5466. A full flowering occurred on the Nilgiris in 1908 (*Bourne*).

***Strobilanthes kunthianus* T. Anders.;** *F.B.I.* iv 434, XVIII 13. ENDOPOGON. The common *Strobilanthes* of the open hill-sides. A gregarious shrub; stem 2 feet, reddish, terete, with a ciliate ridge connecting the two opposite leaf-stalks at each swollen node. Leaves $1\frac{1}{2}$ by $\frac{3}{4}$ inch, with stalks of $\frac{1}{2}$ inch, shortly acuminate, glabrous and green above, whitish below: nerves about eight pairs, broad. Spikes of flowers dense, often two or three in the axils or bracts, on a common axillary peduncle. Fertile bracts closely imbricated in four rows, ovate acuminate. Corolla about 1 by $\frac{1}{2}$ inch, pale blue or mauve, inflated above, and with only a very short narrow part below. Stamens two. Pollen grains ellipsoid with ten to twenty longitudinal ribs and grooves. Capsule oblong: seeds four, densely hairy except on the circular basal areola on each of its faces. t. 206. Wight Ic. t. 448.

On the open hill-sides, covering large areas, on both plateaus, common. *Fyson* 533, 1023. *Bourne* 110, 713, 1068.*

Gen. Dist. Mountains of South India, Shevaroy, etc.

In t. 206: *b.* ovary on disc; *c.* stamen with part of corolla.

An occasional plant may be found in flower at all times, but at irregular intervals from 7 to 12 years, the hill-sides are blue with the blossom. One such outburst of flower occurred in 1898, on the Pulneys. Another in 1910. Other collections bear dates 1847 (*Gardner*), 1850 (*Foulkes*), 1851 (*Hohenacker*), 1852 (*Wight*) at Avalanche.

***Strobilanthes cuspidatus* T. Anders.;** *F.B.I.* iv 435, XVIII 16: ENDOPOGON. Distinguished among our *Strobilanthes* by the white underside of the leaves and the slender spikes with narrow sticky bracts and sepals. Shrub 2 to 5 feet: young parts, and nodes of older, sticky. Leaves long-stalked $1\frac{1}{2}$ to 4 by 1 to $2\frac{1}{2}$ inches, ovate, acuminate at both ends, glabrous above, white below; nerves eight pairs very regularly spaced, veins indistinct: stalk $\frac{3}{4}$ to $1\frac{1}{2}$ inches. Spikes $1\frac{1}{2}$ to $2\frac{1}{2}$

inches by $\frac{1}{3}$ inch, stalked in the leaf-axils, with often a pair of small leaves, $\frac{1}{4}$ to $\frac{1}{2}$ inch long, about the middle of the stalk: bracts elliptic long-acuminate $\frac{1}{2}$ to $\frac{5}{8}$ inch: bracteoles linear $\frac{1}{2}$ to $\frac{5}{8}$ inch. Sepals as long covered with long gland-tipped hairs. Narrow basal part of corolla $\frac{1}{6}$ inch; broader part $\frac{3}{4}$ by $\frac{1}{3}$ inch; limb slightly spreading of five rounded lobes. Stamens two. Pollen grains ellipsoid with about fourteen (twelve to twenty) longitudinal ribs and grooves. Capsule $\frac{1}{2}$ by $\frac{1}{6}$ inch shorter than the sepals. Seeds flat, apparently glabrous, but if wetted showing a dense fringe of circular hairs. t. 207.

Nilgiris: near Ootacamund, January 1911 *Fyson*, March 1914 *Bourne* 6347; Coonoor *Clarke*.

Earlier flowering dates appear to have been: 1838 (*Munro*), 1849 (*Wight*), 1851 (*Hohenacker*), 1870 (*Clarke*). In the Wynad 1903 (*Barber* 5686).

In fig 207: *c* bract, inner surface glabrous; outer with glandular hairs; *d* ripe fruit; *e* same opened; *f* seed dry; *g* seed in-water showing spreading hairs.

***Strobilanthes wightianus* Nees; F.B.I. iv 438, XVIII 24.** A coarsely hairy shrub of 2 to 3 feet: young parts covered with short deflexed hairs. Leaves $\frac{3}{4}$ to 2 inches, with stalks half as long; ovate, thick, roughly hairy, finely serrate. Flowers in shortly stalked axillary bunches. Bracts $\frac{3}{4}$ to 1 inch, elliptic, acuminate, longer than the sepals: bracteoles $\frac{2}{3}$ inch, narrow. Sepals linear. Corolla campanulate, $\frac{3}{4}$ to 1 inch, with narrow part of tube very short, nearly glabrous outside, hairy on lines inside: tube brown, limb very pale blue with darker veins. Pollen grains ellipsoid with ribs and tubercles. Ovary glabrous. Capsule $\frac{1}{3}$ inch oblong, four-seeded. Seeds $1/10$ inch, thin, elliptic, glabrous. t. 208.

Nilgiris: near Ootacamund, etc. *Fyson* 1043. *Bourne* 5220. September 1908 to January 1909. Kotagiri, September 1910.

Earlier Collections were 1847 (*Gardner*), 1848 (*Wight*), 1050 (*Munro*), 1851 (*Hohenacker*).

***Strobilanthes sessilis* Nees**; *F.B.I.* iv 452, XVIII 69. Flowers in close spikes as in *S. kunthianus* but whole plant hairy and leaves broadly ovate or cordate, not white below.

Rootstock woody : stems numerous, unbranched, 8 to 18 inches covered with rough hairs. Leaves sessile, $1\frac{1}{4}$ by 1 inch, ovate with cordate or straight base, crenate, softly villous. Spikes $1\frac{1}{2}$ to 2 by $\frac{1}{2}$ inch : bracts closely imbricate, ovate-acuminate, $\frac{1}{2}$ inch. Corolla $1\frac{1}{2}$ inches, tubular, pale purple. Stamens four. t. 209. Wight Ic. t. 1511.

Nilgiris : on the downs.

Gen. Dist. Mountains of South India. Not collected on Pulneys.

In full flower summer of 1904 (*Bourne*). Other flowering periods appear to have been 1838 (*Russell*), 1847 (*Gardner*), 1849 (*Wight*), 1850 (*Foulkes*), and at Avalanche 1852 (*Wight*).

***Strobilanthes sexennis* Nees**; *F.B.I.* iv 474, XVIII 138. Leaves sessile or stalked, elliptic, acute at both ends, serrate, covered on both sides with short hairs. Nerves about seven pairs. Spikes interrupted; bracts ovate-acute. Corolla $1\frac{1}{2}$ inches, cylindrical with small limb, glabrous. Stamens four, filaments hairy. Pollen grains ellipsoid (?) with longitudinal ribs (possibly due to drying).

Nilgiris : Dodabetta (*Hohenacker*). Pulneys : Pillar Rocks, 1898 ; downs 1908. (*Bourne*.)

Gen. Dist. Also Ceylon (the origin of the species).

ANDROGRAPHIS. *F.B.I.* 109 XXVIII.

Distinguished from all our other genera of this order by the two stamens with their broad, stiff, white filaments, and jet black anthers, projecting out from the widely open corolla ; the style between or below them. Herbs or shrubs, erect or procumbent. Leaves entire. Flowers often in one-sided racemes forming large

terminal panicles. Capsule narrow-oblong, twice as broad as thick, the septum across the narrower diameter.

Species 18—20 confined to tropical Asia, and mostly to India.

Stems erect, panicles dense *A. lineata*.

Stems procumbent, leaves roundish *A. lobelioides*.

***Andrographis lineata* Nees; Wall. Cat. 2486! (Herb. Wight); including *A. viscosula* Nees and *A. neesiana* Wight; F.B.I. iv 504, XXVIII 13.** Stem and branches up to 2 feet, stiff, prominently four-angled; youngest parts covered with glandular hairs. Leaves spreading downwards, elliptic or ovate-oblong, glabrous, but when dry roughened by raphides below the surface. Flowers in one-sided racemes in the axils of the upper and smaller bract-like leaves, all green parts very glandular, forming dense terminal panicles. Pedicels $1/16$ inch. Calyx-teeth longer than the tube. Upper and lower lips of the corolla widely separated, and pointing in almost diametrically opposite directions. Stamens and style pointing stiffly outwards, and bisecting the angle between the lips; filaments white, thick, ciliate with deflexed hairs; anthers jet black, glabrous except for a tuft of white hairs at the base. Capsule glandular, oblong, pointed at each end.

Nilgiris: near Ootacamund on Dodabetta. Pulneys: on the downs. *Fyson* 359, 1127, 1211, 2273. *Bourne* 119, 499, 1280.*

A. viscosula Nees; *Wall. Cat.* 2406 (ex. Herb. Heyne) has slightly smaller leaves: a difference merely of growth.

* *var neesiana* Wight: leaves larger, 3 to 4 by $1\frac{1}{4}$ to $1\frac{1}{2}$ inches, ovate-acute, with jointed hairs on the upper side, but few or no raphides. Wight l.c. t. 1561.

Nilgiris: near Lovedale. Pulneys: common from 5,500 feet upwards. *Fyson* 1127, 1211, 1530. *Bourne* 515, 1682, 2102, 2484.

A. affinis Nees; *Wall. Cat.* 2486 a *ex parte*, is a small plant of this.

Andrographis lobelioides *Wight, Herb. Prop!*; *F.B.I.* iv 505, XXVIII 14. Remarkable for its short weak stems, small leaves and comparatively large brown flowers.

Rootstock perennial, woody, $\frac{1}{2}$ inch or so thick, vertical. Stems many, 3 to 12 inches, often forking or trichotomous, spreading outwards on the ground, pubescent or tomentose and with longer gland-tipped hairs. Leaves $\frac{1}{5}$ to $\frac{1}{2}$ inch, ovate-acute, nearly sessile, covered on the upper sides, margins and nerves of the underside with gland-tipped hairs. Racemes or panicles terminal, often one-sided though the bracts are in opposite pairs: pedicels $\frac{1}{8}$ to $\frac{1}{6}$ inch. Sepals as long. Corolla $\frac{3}{4}$ inch; limb equal to the tube; upper lip three-fid, pinkish; lower two-lobed, purplish brown. Anthers well exerted, white with stiff hairs. Fruit $\frac{5}{8}$ by $\frac{1}{12}$ inch. t. 210. *Wight* Ic. t. 1557.

On the open downs. Nilgiris: Ootacamund to Pykara and Coonoor. Flowering early summer. Not recorded elsewhere. *Fyson* 683. *Bourne* 4595, 4781.

JUSTICIA. F.B.I. 109 XXXVIII.

Herbs with opposite entire leaves, and terminal bracteate spikes or panicles of violet, rosy, or white two-lipped flowers. Upper lip of corolla inside, the middle lobe of the lower lip outermost, in bud. Stamens two, one-half anther below the other and with a white tail. Fruit a capsule with four seeds.

Species about 100 in the warmer parts of the world.

Justicia nilgherrensis *Wall.*; *F.B.I.* iv 526, XXXVIII 3. Remarkable for the short fat greyish green spikes, and the comparatively large-mouthed flowers, with broadly-spreading three-lobed lower lip.

Rootstock thick and short with long woody roots. Stems numerous five to ten, procumbent, finely ribbed but

quite glabrous, greenish but purple just above a node. Leaves $1\frac{1}{4}$ to $1\frac{1}{2}$ by $\frac{1}{4}$ to $\frac{1}{2}$ inch, sessile oblong-lanceolate, obtuse, soft and greyish green, glabrous, minutely punctate, and with finely ciliate margin. Spikes 2 to 4 inches, bracts $\frac{2}{3}$ by $\frac{1}{3}$ inch, ovate, very acute, white but with large green nerves; bracteoles nearly as large. Sepals five, $\frac{1}{5}$ inch, all equal, linear acute, joined only near the base. Corolla tube slightly longer, broadening suddenly $\frac{1}{8}$ inch above the base: upper lip $\frac{3}{5}$ by $\frac{2}{5}$ very concave, notched: lower lip $\frac{1}{2}$ inch wide, three-fid; lobes $\frac{1}{5}$ by $\frac{1}{8}$ to $\frac{1}{6}$ inch, spreading widely; middle lobe rounded, slightly broader than the lateral. Pod $\frac{3}{4}$ inch, dark purple above, velvety, laterally contracted at the base. Seeds $\frac{1}{6}$ inch, papillate. t. 211.

In the open grass. Nilgiris: on the downs, common; flowering early summer down to Pykara. *Fyson* 644, 2485. *Bourne* 4587, 4774, 4825. Apparently Nilgiris only.

Justicia simplex Don; *F.B.I.* iv 539, XXXVIII 49. Stem and branches slender villous, procumbent from a perennial rootstock. Leaves ovate or elliptic, acute or not, entire or minutely waved, $\frac{1}{4}$ to $\frac{1}{2}$ inch, with stalk $\frac{1}{6}$ inch; covered as are all green parts with white hairs $\frac{1}{8}$ or so long. Spikes terminal, erect, $\frac{1}{2}$ to 2 inches by $\frac{1}{4}$ inch: bracts and sepals $\frac{1}{6}$ inch, narrow hairy. Corolla $\frac{1}{4}$ inch pink. Fruit elliptic $\frac{1}{5}$ by $\frac{1}{8}$ inch. t. 212.

In the open grass. Nilgiris: on the downs, on the banks and sides of cattle tracks, etc., common from Ootacamund to Pykara, flowering May to September. Pulneys: in sholas on the downs and below. *Fyson* 606, 1201, 1469, 2898. *Bourne* 486,* 1688, 2104, 4590, 5221.

Gen. Dist. Widely distributed over India from Kashmir to Travancore. Also Abyssinia, Malay States, etc.

Don's description was based on a Nepal plant of Wallich's. The Nilgiri specimens are smaller but otherwise I think not in any way different.

RUNGIA.

F.B.I. 109 XLVI.

Herbs often small and creeping with entire leaves and one-sided spikes of two rows of bracts of which however one row only has flowers: distinguished by the broad white margin to the bracts. Corolla two-lipped: upper lip inside; lower outside in bud. Stamens two, anthers equal. Seeds four to the capsule.

Species 20 nearly all in India, 2 in Africa.

Rungia læta Clarke; *F.B.I.* iv 546, XLVI 3. Distinguished among all our plants by the broad white margins to the bracts.

Stem terete, bent at the nodes. Leaves acute at both ends ovate elliptic, 2 to 4 by $1\frac{1}{4}$ to 2 inches, narrowed to the $\frac{1}{4}$ to $\frac{3}{4}$ inch stalk. Racemes axillary, $\frac{1}{2}$ to 2 inches, with one or a few pairs of empty smaller bracts at the base. Flowering bracts ovate-acute, $\frac{1}{2}$ to $\frac{5}{8}$ by $\frac{1}{3}$ inch, thin with broad pinkish margin. Corolla lips divergent. Anthers $\frac{1}{12}$ inch, under the end of the upper lip. Fruit $\frac{1}{3}$ to $\frac{1}{2}$ inch, obovate, pubescent; valves very elastic. Seeds two in a cell, dark brown, papillose.

Pulneys: in the Kodaikanal shola. *Fyson* 448. *Bourne* 123, 1140, 1399, 2326.

The species was founded by Clarke on a small piece 6 inches long without fruit.

VERBENACEÆ.

Herbs, shrubs or trees. Leaves opposite or in threes. Flowers nearly regular. Five-lobed or two-lipped. Stamens four only. Ovary superior two-carpelled containing more than four seeds, whose micropyle (and radicle) points downwards. Inflorescence cymose or racemose. Fruit fleshy or dry, with two or four hard stones enclosing the seeds.

Species 700, chiefly in the tropics. None belong truly to these high levels.

Flowers in spikes, mouth very small VERBENA.

Flowers in narrow panicles of cymes, mouth very wide . . .
CLERODENDRON.

VERBENA.

F.B.I. III VII.

Vervein.

Pubescent herbs or undershrubs with the characters given above for the family. Flowers in terminal spikes, calyx tubular five-toothed and five-nerved. Corolla with slender tube and spreading limb or five nearly equal oblong-obtuse lobes. Ovary of four cells with one erect seed in each. Fruit separating into four stony parts each with one seed.

Species 100 natives mostly of America. *V. officinalis*, Vervein is widely distributed over the whole world. Here we have only two garden-escapes.

Spikes few, 1 to 2 inches by $\frac{1}{3}$ to $\frac{1}{2}$ inch; corolla tube $\frac{1}{2}$ inch *V. venosa*.

Spikes twenty to forty in a large cymose corymb; corolla tube $\frac{1}{8}$ inch *V. bonariensis*.

***Verbena venosa* Gill and Hooker**; VII 2; stem 2 to 3 feet angled, pubescent. Leaves sessile, and clasping the stem by their broad auricled bases, 3 by 1 inch, elliptic or lanceolate, acute: margin with sharp outwardly directed teeth: upper surface scabrid: lower with prominently raised nerves and veins. Spikes long-peduncled, terminating the stem and in the axils of the uppermost bract-like leaves, 1 to 2 inches by $\frac{1}{3}$ to $\frac{1}{2}$ inch. Corolla tube $\frac{1}{2}$ inch curved upwards; limb $\frac{1}{4}$ inch. Stigmatic lobes small. Fruit egg-shaped, $\frac{1}{8}$ by $\frac{1}{16}$ inch, enclosed in the calyx from which the persistent style still protrudes. t. 213.

Native of Brazil. Common at Kodaikanal, where Mr. Tracey of the American Mission tells me it was introduced by him accidentally among grass seed. Nilgiris: Ootacamund, Coonoor, etc., no doubt as a garden-escape. *Fyson* 3061.

Verbena bonariensis *Linn*; *F.B.I.* iv 565; VII Easily distinguished from the above by the much more numerous and slenderer spikes, with inconspicuous bracts and smaller flowers.

Leaves sharply serrate in the further half, entire in the nearer. Flowering part of stem much branched so as to form a large cymosely branched corymb of twenty to forty spikes, which are often in well-marked cymes of three of which the middle spike is sessile, the lateral ones stalked. Bracts $\frac{1}{6}$ to $\frac{1}{4}$ inch. Corolla tube $\frac{1}{8}$ to $\frac{1}{6}$ inch half as long again as the calyx-shaped or broader upwards, with $\frac{1}{8}$ to $\frac{1}{6}$ inch limb. Stigmatic lobes distinct. Fruit enclosed in the calyx which is now a little longer than the bract. t. 214 (*doubtful*).

Native of Brazil. Said to occur as an escape on the Nilgiris but I have not myself seen it.

Plants at Kew of the Himalayas and Nilgiris named by Clarke for the *F.B.I.* as this species, are *V. venosa* *Gill and Hooker*.

CLERODENDRON.

F.B.I. XIV.

Shrubs or trees with the characters given above for the family but the flowers in cymes. Calyx, campanulate and corolla tube slender, with limb of five spreading lobes, more or less two-lipped. Fruit fleshy with four stones.

Species about 70 in warm countries, more especially the east.

Clerodendron serratum *Spreng*; *F.B.I.* iv 592, XIV II. A robust shrub with large coarsely serrate leaves, and terminal narrow panicles 3 to 6 by 2 inches, of blue flowers, with conspicuously wide oblique mouth, and long protruding stamens and style.

Pulneys : near Kodaikanal on the slopes below the cemetery and near the ghat road. Nilgiris : Coonoor, not at high levels. *Fyson* 287. *Bourne* 143.

Gen. Dist. Himalayas to Ceylon, common in Bengal.

LABIATÆ.

Herbs with opposite leaves and cymes of flowers usually in very dense whorls at the leaf-axils or condensed into dense spikes of such whorls, and like BORAGÆ with fruit consisting always of four separate one-seeded nutlets. Corolla monopetalous, subequally five-lobed or strongly two-lipped. Stamens four, in two pairs, attached to the corolla-tube differing in position and relative length. Ovary superior seated on a conspicuous disc, of two carpels, but four-celled. Nutlets varying in the position of their attachment to the central axis.

Species 2,000 or more, native mostly of the north temperate regions, especially round the Mediterranean and in Asia Minor and Syria.

This large family is divided into a number of tribes of which the following occur here wild or are common in gardens:—

1. *OCIMOIDEÆ*: perfect stamens four bent down; anther cells confluent (apparently one only to each anther). Basal scar of nutlet small, e.g., LAVENDULA Lavender, COLEUS.

2. *SATUREINEÆ*: perfect stamens four, the upper (middle) pair longer, or two only straight and diverging. Corolla two-lipped or not, e.g., MENTHA Mint, THYMUS Thyme, CALAMINTHA Catmint.

3. *MONARDEÆ*: perfect stamens two, anther cells of a stamen separated by a short or long filament, and often one sterile or absent, e.g., SALVIA.

4. *STACHYDEÆ*: perfect stamens four, lower (outer) pair longest. Upper lip of corolla hooded, lower lip spreading, three-fid, e.g., SCUTELLARIA Skullcap, BRUNELLA Self-Heal, STACHYS Botony, etc. LAMIUM Dead-Nettle, LEUCAS.

5. *AJUGOIDEÆ*: nutlets with a particularly large oblique or lateral arcola by which attached to the central axis, e.g., TEUCRIUM Wood Germander, AJUGA Bugle.

PLECTRANTHUS. F.B.I. 112 VIII.

Cockspur Flower.

Herbs or undershrubs with flowers in loose cymes not dense whorls, otherwise having the characteristics of the family and tribe 1 *OCIMOIDEÆ* (p. 321), and remarkable for the small calyx and much larger corolla, with upper lip of three or four teeth, and lower very concave and boat-shaped, in which lie the stamens.

Verbena bonariensis *Linn*; *F.B.I.* iv 565; VII. Easily distinguished from the above by the much more numerous and slenderer spikes, with inconspicuous bracts and smaller flowers.

Leaves sharply serrate in the further half, entire in the nearer. Flowering part of stem much branched so as to form a large cymosely branched corymb of twenty to forty spikes, which are often in well-marked cymes of three of which the middle spike is sessile, the lateral ones stalked. Bracts $\frac{1}{6}$ to $\frac{1}{4}$ inch. Corolla tube $\frac{1}{8}$ to $\frac{1}{6}$ inch half as long again as the calyx-shaped or broader upwards, with $\frac{1}{8}$ to $\frac{1}{6}$ inch limb. Stigmatic lobes distinct. Fruit enclosed in the calyx which is now a little longer than the bract. t. 214 (*doubtful*).

Native of Brazil. Said to occur as an escape on the Nilgiris' but I have not myself seen it.

Plants at Kew of the Himalayas and Nilgiris named by Clarke for the *F.B.I.* as this species, are *V. venosa* *Gill and Hooker*.

CLERODENDRON.

F.B.I. XIV.

Shrubs or trees with the characters given above for the family but the flowers in cymes. Calyx, campanulate and corolla tube slender, with limb of five spreading lobes, more or less two-lipped. Fruit fleshy with four stones.

Species about 70 in warm countries, more especially the east.

Clerodendron serratum *Spreng*; *F.B.I.* iv 592, XIV II. A robust shrub with large coarsely serrate leaves, and terminal narrow panicles 3 to 6 by 2 inches, of blue flowers, with conspicuously wide oblique mouth, and long protruding stamens and style.

Pulneys : near Kodaikanal on the slopes below the cemetery and near the ghat road. Nilgiris : Coonoor, not at high levels. *Fyson* 287. *Bourne* 143.

Gen. Dist. Himalayas to Ceylon, common in Bengal.

LABIATÆ.

Herbs with opposite leaves and cymes of flowers usually in very dense whorls at the leaf-axils or condensed into dense spikes of such whorls, and like BORAGÆ with fruit consisting always of four separate one-seeded nutlets. Corolla monopetalous, subequally five-lobed or strongly two-lipped. Stamens four, in two pairs, attached to the corolla-tube differing in position and relative length. Ovary superior seated on a conspicuous disc, of two carpels, but four-celled. Nutlets varying in the position of their attachment to the central axis.

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4. *STACHYDEÆ*: perfect stamens four, lower (outer) pair longest. Upper lip of corolla hooded, lower lip spreading, three-fid, e.g., SCUTELLARIA Skullcap, BRUNELLA Self-Heal, STACHYS Botany, etc. LAMIUM Dead-Nettle, LEUCAS.

5. *AJUGOIDEÆ*: nutlets with a particularly large oblique or lateral arcola by which attached to the central axis, e.g., TEUCRIUM Wood Germander, AJUGA Bugle.

PLECTRANTHUS. F.B.I. 112 VIII.

Cockspur Flower.

Herbs or undershrubs with flowers in loose cymes not dense whorls, otherwise having the characteristics of the family and tribe 1 *OCIMOIDEÆ* (p. 321), and remarkable for the small calyx and much larger corolla, with upper lip of three or four teeth, and lower very concave and boat-shaped, in which lie the stamens.

Species 150, in south and tropical Africa, tropical and sub-tropical Asia, spreading eastwards to Japan, Malacca, Australia and the Pacific islands.

Fr. Germaine, *Ger.* Hahnensporn. Closely allied to *COLEUS*, in which, however, the filaments of the stamens are united.

Plectranthus wightii Benth., *Sir F. Adams coll. ! Herb. Wight* 2096 ! ; *F.B.I.* iv 619, VIII 12 ; including *P. pulneyensis* Hook. f., *Herb. Wight* 2096 ! ; *F.B.I.* iv 617 ; and *P. nepetæfolius* Benth., *Herb. Wight* 2507 ! ; *F.B.I.* iv 619.

Stem 1 to 3 feet, simple or branched : whole plant nearly glabrous, pubescent or softly hairy, and with or without red glands. Lower leaf-stalks $\frac{1}{2}$ to $1\frac{1}{2}$ inches, upper absent. Leaves thin or thick, ovate, with acute, cordate, or nearly straight base, toothed nearly all round : upper small. Panicle large with foliaceous bracts, which may or may not fall before the fruits mature. Cymes very lax, sometimes $1\frac{1}{2}$ inches. Calyx small $\frac{1}{16}$ to $\frac{1}{12}$ inch ; in fruit $\frac{1}{8}$ to $\frac{1}{6}$ inch, slightly curved and gibbous at the base, teeth nearly equal. Corolla tube $\frac{1}{6}$ inch, lower lip $\frac{1}{8}$ inch, stamens longer. *Wight* Ic. t. 1429.

On the downs. Nilgiris and Pulneys, common. *Fyson* 1353, 1479, 3063, 3064, 3065, 3066, 3067. *Bourne* 222,* 1142,* 1176,* 1627, 1628, 1711, 1712, 1799, 2011, 2941,* etc.

After considerable examination of the types and other specimens I cannot but think that the three species named above are all one : and that *P. wightii* in Bentham's *Labiata*, p. 41 being the oldest name must stand for the three.

Plectranthus nilghiricus Benth., *Sir F. Adams on Nilgiris ! ; F.B.I.* iv 619, VIII 13.

Stem short and branches usually decumbent. Leaves similar in shape to *P. wightii* but much thicker, and flowers more numerous. Possibly a variety, but more succulent.

Nilgiris : Kotagiri (*Sir F. Adams*). Pulneys : on the downs (*Bourne*),

Plectranthus macræi Benth.; *F.B.I.* iv 620, as part of *P. menthoides Benth.*, but not *Wall. Cat.* 2744!; VIII 18.* A stout herb with thick hairy leaves, conspicuously veined, and narrow dense spikes in large terminal panicles. Stem 2 to 5 feet, all parts densely villous. Leaves very variable in size, but attaining 3 by 2½ inches, stalked, ovate-acute with rounded or narrowed base, and triangular teeth, softly pubescent on both sides; upper surface divided into small areas by the impressed veins. Spikes often dense, in the axils of the upper leaves, or elongated and leafy, the whole panicle 12 to 18 by 6 to 8 inches: bracts numerous like small leaves, sometimes larger towards the top. Calyx hardly two-lipped; in fruit villous. *Wight Ic.* t. 1430.

On the downs of both plateaus, from 5,000 feet upwards. Flowering after the rains. On a knoll behind Ampthill wood near Ootacamund is an almost pure plantation of this. *Fyson* 682, 1091, 3067, 3068. *Bourne* 90, 415, 716*.

Gen. Dist. These hills and Ceylon.

P. menthoides Benth. to which this is reduced in *F.B.I.* is a North Indian species, with narrower and much less hairy, almost glabrous leaves.

Plectranthus coleoides Benth.; *Perrottet on 'Nilgiris* 1847'!; *F.B.I.* iv 622, VIII 27. Stem 1 to 2 feet, erect, obscurely four-angled, green, spotted with purple; pubescent above, as are the leaf-stalks, underside of leaves, and the inflorescence. Leaves 1½ to 5 inches, broadly ovate, obtuse, with rounded or cordate base, and crenate margin. Inflorescence 4 to 8 inches, simple or branched; whorls rather distant and loose; peduncles 1 to 1¼ inches: pedicels erect, ⅙ inch, purplish. Calyx at first small, but in fruit nearly ¼ inch: lower teeth triangular acute: upper broader. Corolla-tube bent down sharply just beyond the calyx, then broadening to the very oblique mouth: lower lip boat-shaped, hairy inside: upper with four rounded lobes spreading backwards. *Wight Ic.* t. 1433. *Bot. Mag.* t. 5841.

Nilgiris: near Ootacamund on Snowdon and below.
Bourne 4633.

Plectranthus urticifolius Hook. f.; *Wight Herb. Prop.* 622!; *F.B.I.* iv 622, VIII 28; Nettle-leaved Giant Cockspur. Stem stout, to 4 or 5 feet, pubescent in the younger parts, nearly glabrous below. Leaf-stalks 2 inches: blades 3 to 6 inches long and broad, broadly ovate, with large rounded teeth $\frac{1}{4}$ inch deep, themselves crenate; when young densely pubescent or tomentose underneath, becoming nearly or even quite glabrous with age; thin. Cymes, at least the lower, stalked. Calyx $\frac{1}{12}$ inch, campanulate. Corolla $\frac{2}{3}$ inch, with slender tube and inflated mouth, very distinctly two-lipped, much decurved.

Pulneys: Kodaikanal, by road-sides in rich cool soil.
Fyson 314. *Bourne* 1143, 2035.

COLEUS.

F.B.I. 112 IX.

Flame-Nettle.

Herbs, shrubs or trees with the characters of the family and tribe I *OCIMOIDEÆ* (p. 321), and remarkable for the often coloured bracts and the large underlip of the corolla in which lie the stamens, and peculiar in the filaments of the stamen being connected together at the lower end into a sheath split down the upper side and wrapping round the style.

Species about 120 in tropical and sub-tropical regions of the Old World especially Africa, the India and Malay archipelagoes, and extending to Australia and the Pacific islands.

C. bicolor and *C. laciniatus* are cultivated in gardens. *Ger.* Buntlippe.

Coleus barbatus Benth.; *F.B.I.* iv 625, IX 2. Stem 1 to 2 feet, woody at the base, hispidly tomentose. Leaves stalked, ovate, crenate, narrowed to the base, softly hairy on both sides. Flowers sessile in whorls of about six, at intervals in an unbranched spike 6 to 12

inches long. Upper lip of calyx broadly ovate, in fruit $\frac{1}{6}$ inch : lower teeth four, as long, slender. Corolla pale blue ; upper lip $\frac{1}{8}$ inch, lower $\frac{1}{2}$ inch. Nutlets about $\frac{1}{30}$ inch. t. 215. Wight Ic. t. 1432.

Nilgiris : Ootacamund, etc., flowers in August. Pulneys : only at low levels. *Fyson* 3069, 1238. *Bourne* 129, 281, 577, 5230, etc.

Gen. Dist. Himalaya mountains and mountains of central and southern India, Poona and Western Ghats remaining up to our levels.

ANISOCHILUS.

F.B.I. 112 X.

Herbs having the characters of the family and tribe 1 *OCIMOIDEÆ* (p. 321), with flowers in dense, long or short spikes. Calyx with truncate or oblique nearly toothless mouth. Corolla small, its slender tube bent down : lower lip boat-shaped : upper of three or four teeth. Stamens bent down inside the lower lip.

Species 20 in India and tropical Africa.

Anisochilus dysophylloides *Bentham*, *Wall. Cat.* 2756 ; *F.B.I.* iv 628, X 6. Grows in grey rounded masses a foot or so high on exposed summits and hill-sides ; flowering in the winter, in summer showing only thin dried cylindrical fruiting spikes ; quite common.

Stem woody, covered with a thick coat of erect hairs, leafless. Annual leafy shoots round, silky all over, as also the leaves. Leaves broadly obovate or elliptic, 1 by $\frac{3}{4}$ inch, with shallow crenations in the further half, thick and juicy, aromatic if crushed : midrib broad and white, with two to three pairs of nerves. Flowers minute, crowded, with broad bracts, into erect cylindrical (compound) spikes 1 to 3 by $\frac{1}{5}$ to $\frac{1}{3}$ inch, terminating the annual shoot or peduncled in the upper axils. Calyx with five small equal teeth, thickly covered with small red glands. Corolla $\frac{1}{8}$ inch, its lobes $\frac{1}{30}$ inch, the lowest slightly larger than the others, purple. Fruiting

spikes at the ends of the now leafless shoots at length a solid mass of small calyxes, with mouths of $\frac{1}{20}$ inch, arched over by the upper lip. t. 216. Wight Ic. t. 1434.

In dry places, tops of the higher hills, etc., very abundant, e.g., Elk hill and Snowdon near Ootacamund. Also lower down on the Pykara slopes. Flowering December, only old fruiting spikes seen in summer. *Fyson* 1494, 2012. *Bourne* 1715, 2336.

The species was founded on a plant of Wight's, and varies slightly. At lower levels the leaves are smaller, the spikes narrower and stalked, and the flowers white—this is Wight's plant and he called it *albidus*. The highland form (described above) has thicker leaves and thicker nearly sessile spikes. A specimen of this in Herb. Wight is marked *A. purpureus*.

POGOSTEMON.

F.B.I. 112 XII.

Herbs or undershrubs with the characters of the family and tribe 2 *SATUREINEÆ* (p. 321), and remarkable for the very dense spikes in which the flowers appear in tight wedge-shaped bunches (remining one of the spikelets of wheat); and distinguished further by the calyx having five equal teeth, the corolla four nearly equal lobes, by the four straight often hairy filaments and one-celled anthers.

Species 28 to 30 in India, Malaya and Japan.

Pogostemon mollis Benth., *Herb. Wight* 2525!; *F.B.I.* iv 635, XII 17. All green parts densely tomentose, or glabrous. Leaf-stalks $\frac{1}{6}$ inch, blade $\frac{1}{2}$ to 1 by $\frac{3}{4}$ inch, toothed. Spikes dense 3 to 6 inches. Calyx $\frac{1}{6}$ inch; teeth slender $\frac{1}{30}$ inch. Corolla white, its tube hardly exerted from the calyx. Filaments of stamens bearded. Wight Ic. t. 1441 (but lower leaves too large).

Nilgiris: Ootacamund, Lovedale, Coonoor, flowering October to March. Apparently only on these hills. *Fyson* 2025.

I have a form also with large bracts, conspicuously longer than the flowers, all green parts shaggy, calyx-teeth more slender, flowers larger, and leaves also larger with larger teeth. Collected in Ootacamund in December.

Pogostemon speciosus *Benth.*, *Herb. Wight* 361 !; *F.B.I.* iv 637, XII 22. Remarkable for the long stamens which project $\frac{1}{3}$ inch, and give a bottle-brush-like appearance to the spike.

Stem 2 to 3 feet, woody; upper parts, leaf-stalks, and spikes hirsute. Leaf-stalk 1 to 2 inches. Blade $1\frac{1}{2}$ to 3 inches long and nearly as broad, ovate, with crenate margin and cordate or nearly horizontal base; sparingly hairy on the upper side and on the veins of the lower side. Spikes terminal, 3 to 6 inches; flowers nearly sessile. Calyx $\frac{1}{5}$ inch, with minute teeth fringed with fine hairs. Corolla $\frac{1}{4}$ inch; its tube narrow $\frac{1}{10}$ inch, broadening above into four nearly equal lobes. Stamens twice as long. t. 217. *Wight* Ic. t. 1443.

In shady and cool places, on the outskirts of sholas, etc. Nilgiris: in and near Ootacamund. Also Anamalais. *Fyson* 2227, 3069.

MICROMERIA. *F.B.I.* 112 XXIII.

Herbs or undershrubs with small leaves and axillary whorls or terminal unbranched, not paniced, spikes; having the characters of the family and tribe 2 *SATUREINEÆ* (p. 321), but characterised by the calyx having five teeth and thirteen ribs (two between the midribs of the three lower teeth, one only between those of the upper). Corolla with flat upper lip and three spreading lobes below.

Species about 70, in all regions of the world except Australia and New Zealand. Europe has 40, but there are none in Britain.

Micromeria biflora *Benth.*; *F.B.I.* iv 650, XXIII 2; Lemon-scented Thyme. Distinguished by its smell, small leaves, and purplish flowers usually out a pair at a time. Rootstock stout, woody. Stems very numerous,

2 to 6 inches, slender, occasionally branched, glabrous pubescent or sparingly hairy. Leaves $\frac{1}{4}$ inch, ovate acute, subsessile, at internodes of $\frac{1}{4}$ to 1 inch. Flowers in small cymes at the leaf-axils. Calyx slender, $\frac{1}{6}$ by $\frac{1}{20}$ inch. Corolla $\frac{1}{4}$ inch, strongly scented. t. 218. Wight Ic. t. 1446, Ill. t. 176 bis f. 5.

On the downs, all over in grass, common. *Fyson* 347, 2110. *Bourne* 21, 600, 1718.

Gen. Dist. Higher mountains of South India, Himalayas from Kashmir to Bhotan. Afghanistan, Arabia, Abyssinia, South Africa.

CALAMINTHA. F.B.I. 112 XXIV.

Catmin.

Herbs with ovate toothed leaves, and loose or dense whorls of purplish flowers, with the characters of the tribe 2 *SATUREINEÆ* (p. 321), but the calyx two-lipped. Ribs of calyx thirteen. Corolla much as in *MICROMERIA*.

Species about 50, in north temperate regions. In Europe about 30. *Eng.* Wild Basil, Basil Thyme, Catmint, etc.

Calamintha umbrosa Benth. ; *F.B.I.* iv 650, XXIV 2 ; Catmint. Stem rising to three feet, weak at the base, pubescent or sparingly hirsute. Leaves $\frac{1}{2}$ to $1\frac{1}{2}$ inches, ovate, acute, serrate, shortly stalked, pubescent on both sides. Whorls lax or dense flowered, in the leaf-axils and at the ends of short branches : bracts subulate. Calyx hairy, $\frac{1}{6}$ to $\frac{1}{4}$ inch, slender, purplish : upper teeth triangular, lower longer subulate. Wight Ic. t. 1447.

In woods, etc., on the downs. *Fyson* 356, 549, 1214, 1232, 1868, 2528, 2122, 3072. *Bourne* 781,* 1719, 1467.

Very similar to *C. clinopodium Benth.* the Wild Basil of England, which extends eastwards to Kashmir, and perhaps only a form of it, differing chiefly in the stem being weak at the base, and the lower calyx-teeth longer than the upper.

SCUTELLARIA. F.B.I. 112 XXXII.

Skullcap.

Herbs or undershrubs with flowers variously arranged in leafy spikes, racemes, or few at the leaf-axils, and the characters of the family and tribe 4 *STACHYDEÆ* (p. 321), but with the calyx distinctly two-lipped and closed in fruit, and peculiar in the upper lip being deciduous and having a large deciduous pouch (skullcap) on the upper side.

Species 180, all over the world except South Africa and rare in tropical Africa. India has 14, Europe and northern Asia 60. *Fr.* Toque, *Ger.* Lebenkraut.

Scutellaria violacea Heyne; *Wall. Cat.* 21361; *F.B.I.* iv 668, XXXII 4. Stem $\frac{1}{2}$ to 2 feet. Leaves $\frac{3}{4}$ to $1\frac{1}{2}$ by $\frac{1}{2}$ to $1\frac{1}{4}$ inches, sparingly hairy on both sides. Spikes 6 to 12 inches. Flowers two only at a leaf-axil; bracts $\frac{1}{16}$ to $\frac{1}{8}$ inch; pedicels twice as long. Calyx $\frac{1}{12}$ inch. Corolla tube $\frac{1}{2}$ to $\frac{3}{4}$ inch, white tinged with purple or pink. In fruit upper pouched lip of calyx $\frac{1}{4}$ to $\frac{1}{3}$ inch; lower $\frac{1}{8}$ inch. t. 219. Wight Ic. t. 1449, Ill. t. 176 bis f. 7.

In woods and moist shady places, common. *Fyson* 304, 319, 675, 1407, 1759, 3073. *Bourne* 236, 915, etc.

Gen. Dist. Hills of South India and Ceylon.

Scutellaria rivularis Wall.; *F.B.I.* iv 670, XXXII 13. Stem creeping below, above erect, seldom branched, 6 to 8 inches. Leaves $\frac{3}{4}$ to 1 by $\frac{1}{6}$ to $\frac{1}{5}$ inch, subsessile, lanceolate, obtuse; passing above into the floral bracts. Flowers axillary on short stalks. Corolla $\frac{1}{2}$ inch, blue.

Nilgiris: Pykara, *Bourne* 2337.

Gen. Dist. Nepal, Khasia, Burma, China, South Indian mountains.

BRUNELLA. F.B.I. 112 XXXIII.

Self-Heal.

Small herbs with the characters of the family and tribe 4 *STACHYDEÆ* (p. 321), but with a distinctly

two-lipped calyx closed in fruit (not however deciduous and pouched as in SCUTELLARIA), and peculiar in having large rounded bracts in the dense spikes or heads of six-flowered whorls.

Species two or three only in temperate regions.

Brunella vulgaris Linn.; *F.B.I.* iv 670, XXXIII 1; Self-Heal.

Rootstock creeping. Stems 4 to 8 inches, erect or ascending. Lower leaves stalked, upper sessile: blades ovate or oblong-ovate, obtuse, entire or toothed. Heads 1 to 1½ inches, by ¾ inch thick, with a pair of leaves close below. Bracts very broad and rounded, often with purple margin. Corolla ½ to ¾ inch, purple or white: upper lip erect, concave: lower spreading, side lobes deflexed, middle lobe concave. Filaments of stamens divided at the top, with an anther on only one, the lower, arm. Nutlets oblong, smooth. Somewhat variable in habit. t. 220. Wight Ic. t. 1448.

On the open downs in grass, common. *Fyson* 1829, 3078. *Bourne* 6.

Gen. Dist. Temperate climates of Europe including England, Asia, North America, Andes, North Africa and Australia.

LEUCAS.

F.B.I. 112 XLV.

Dead-Nettle (not of England).

Woolly or villous herbs and undershrubs with flowers in dense, well separated, whorls; having the characteristics of the family and tribe 4 *STACHYDEÆ* (p. 321). Calyx tubular or campanulate, ten-ribbed and six to ten-toothed. Corolla with a hooded upper lip covered with stiff hairs and a spreading lower lip with large middle-lobe. Stamens longer than the corolla tube conniving at the anthers under the upper lip.

Species 50 in Asia and Africa.

Leucas marruboides Desf.; *F.B.I.* iv 683, XLV 13; Climbing Dead-Nettle.

Stem and branches four-angled, long and slender, straggling on bushes, etc., and white with a close felt of reflexed hairs. Leaves shortly stalked 1 to 2 by 1 to $1\frac{1}{2}$ inches, ovate cordate, crenate; or the upper side rough with the impressed veins; on the lower white with a dense tomentum. Whorls many-flowered, dense, in the axils of the leaves: bracts linear $\frac{1}{4}$ inch, woolly. Calyx campanulate $\frac{1}{4}$ inch; mouth straight, with ten nearly equal teeth of variable length, not hairy inside. Lower lip of corolla thin.

Nilgiris and Pulney plateaus, flowering in winter months. *Fyson* 1039, 3079.

Gen. Dist. Mountains of South India and Ceylon.

var pulneyensis. Remarkable for its straggling habit, and attaining a height sometimes of 10 feet or more: leaves not so thick, acute, sometimes with sides so straight and base horizontal as to be triangular. Flowers usually fewer (in my specimens two or three only) in a whorl, but many in the type plant. Calyx-teeth longer, half the tube. Corolla large, 1 inch: upper lip $\frac{1}{5}$ inch: lower $\frac{3}{4}$ by $\frac{1}{2}$ inch at the widest, with rounded lobes, lateral spreading, falcate; mid-lobe very delicate in texture, and translucent between the lace-like veins.

Fyson 2087.* *Bourne* 286, 1334,* 1405, 2037, 2343.

Leucas rosmarinifolia Benth.; *Wall. Cat.* 2521!; *F.B.I.* iv 685, XLV 19. A small bush with flat top of dark green erect leaves showing bare bifurcating branches below (*fig. d*). Leaves in bunches (by development of these of the axillary buds. Whorls at first close down among the leafy branches, with two narrow leaves appearing out of the middle, but in fruit raised on long

stalks well above the bush; there being usually two whorls to each such scape, separated by 4 or 5 inches. Bracts as long as the calyx, oblanceolate, like it softly villous or silky. Hairs on margin of calyx, white, longer than the teeth (in dried fruiting flowers they appear as long only or shorter). t. 221.

Nilgiris: Biki, east of Ootacamund. *Fyson 1790. Bourne 4648.*

The figure (ex. *d* and *e*) I give with reserve as it was sent to me by Lady Bourne as of *L. suffruticosa*. The only specimen corresponding to it in the Bourne collection, No. 4648, appears to be this species for it agrees fairly well with my sheet No. 1790, compared at Kew. I have added figures *d* and *e* from a sketch made at the time of collection.

Leucas suffruticosa *Benth* ; *F.B.I.* iv 685, XLV 18. Rootstock thick as the finger, perennial. Stems numerous, tufted, 4 to 8 inches high, branched, covered with yellow, appressed hairs. Leaves 1 to $1\frac{1}{2}$ by $\frac{1}{8}$ to $\frac{1}{6}$ inch, those on the stem usually larger than those on the branches, oblong or oblanceolate-oblong; closely covered on the upper side and on the strong midrib below with short, stiff hairs pointing forwards; white below between the strongly recurved margins: midrib stout, lateral veins not visible: in bud markedly erect, later on spreading. Whorls peduncled 2 to 8 inches above the ordinary leaves, but with two immediately below: calyx and bracts hairy like the stem. Bracts $\frac{1}{5}$ inch, half the length of the calyx, subulate. Calyx campanulate, $\frac{2}{5}$ inch, evenly ten-ribbed and toothed, the teeth $\frac{1}{50}$ inch; mouth surrounded by bristles as long or slightly longer. Corolla tube $\frac{1}{16}$ inch longer than the calyx: hood arching well forwards, densely covered with closely set white hairs, $\frac{1}{12}$ inch long, which curve forwards underneath also, almost closing the entrance to the tube; middle lobe of the lower lip $\frac{1}{2}$ inch wide, semi-circular, notched in the middle, crinkled; side lobes, $\frac{1}{8}$ inch broad, recurved, thin, with a comparatively long

obovate-falcate lobe sticking forwards underneath the mid-lope of the lip. Stamens four, the outer pair longer; anthers equal, reddish brown, opening longitudinally. Nutlets $\frac{1}{8}$ inch, smooth, oblong. t. 222. Wight Ic. t. 1454.

In the figure are shown, calyx, same opened showing the nutlets, corolla with hood bent back, and underside of leaf.

Very common in the grass of the downs. Nilgiris: Pykara, Ootacamund. Flowering from May. *Fyson* 657. *Bourne* 4649 as *L. rosmarinifolia*. Also Anamalais. Not Pulneys.

The hairs on the upper lip of the corolla must serve to keep the very heavy dew of these downs from entering the tube, or wetting the anthers. These latter are not visible being entirely enclosed in the hairs, but are released from them and come forward when the filaments are pressed as by a bee's head. The plant never grows into a bush, but the long peduncle (scape), carries the fruiting whorls 18 inches or more above the ground and in this way gives the nutlets better chances of wide dispersal.

This species seems to take near Ootacamund and especially to the north-west, in the direction of Pykara, the place of *L. helianthemifolia* on the eastern side round Kotagiri, and on the Pulneys near Kodaikanal. In form and in its habitat, among grass, it is very similar, but the general colour is brownish-yellow on dark green, not silvery as the other species, and in fruit especially the long peduncles sufficiently distinguish it.

Leucas helianthemifolia Desf. ; *F.B.I.* iv 685, XLV 20. Hardly a shrub but stems and branches usually 6 to 18 inches, from a woody base: all green parts covered with silvery white hairs. Leaves two, three or even four at a node, and often fascicled (leaves of the axillary bud), linear oblong to elliptic $\frac{1}{3}$ to $1\frac{1}{4}$ by $\frac{1}{8}$ to $\frac{1}{4}$ inch, strongly one-nerved, with recurved margin and densely white tomentose under surface. Whorls many-flowered, solitary or few, with one or two pairs of linear leaves close below, and often also a pair in the centre above. Bracts linear, half the calyx. Calyx-tube $\frac{1}{3}$ to $\frac{1}{4}$ inch, not shaggy; teeth small; mouth with short hairs. Corolla $\frac{1}{2}$ to $\frac{5}{8}$ inch, much as in *L. suffruticosa* (q.v.). Nutlets $\frac{1}{8}$ inch, oblong. Wight Ic. t. 1453.

On the open downs. Pulneys: above Kodaikanal, very abundant. Nilgiris: more common on the drier side, between Ootacamund and Kotagiri. *Fyson* 526, 1691, 1834, 2089. *Bourne* 8, 443, 1171,* etc., 1725.

Gen. Dist. South Indian hills.

Varies somewhat in habit; the leaves in some plants being very stiff almost horizontal and not more than two and a half times as long as broad, in others narrower and erect. In some the foliage is on the whole a light silvery green, in others a dark green.

Leucas lænceæfolia Desf.; *F.B.I.* iv 685, XLV 21; Giant Leucas.

Stem 4 to 8 feet coated with reddish yellow tomentum. Leaves lanceolate, 2 to 4 by $\frac{1}{2}$ to $1\frac{1}{4}$ inches, pubescent and drying black above, white tomentose underneath, with distinct nerves and veins; not quite entire, but shallowly-crenate, or margin notched at $\frac{1}{4}$ inch intervals: odour strong and disagreeable. Whorls many-flowered and very dense, usually three or four to a branch, the lower with fair-sized leaves just below. Calyx quite symmetrical: mouth without hairs inside: teeth ten, $\frac{1}{20}$ inch long with no or much shorter hairs between. Corolla white, or the lower lip cream-coloured: upper lip as in *L. suffruticosa*. t. 223. Wight Ic. t. 1452.

On both plateaus, by the margins of sholas, quite common and often in thick clumps, flowers summer and autumn. On these hills only. *Fyson* 6991, 2026, 1085, 3080, 2937. *Bourne* 1726, 4647, 2345.

Leucas vestita Benth.; *F.B.I.* iv 686, XLV 25. Distinguished from all our other species by the brown upper lip of the corolla.

Stem 2 to 4 feet, shaggy with red or brown hairs. Leaves 3 by $1\frac{1}{2}$ inches, with $\frac{1}{2}$ inch stalk, ovate, acute at both ends, coarsely serrate, covered on the upper side and nerves of the lower, with shaggy hairs, and on the lower surface by a close tomentum. Whorls 1 to $1\frac{1}{4}$ inches across, very dense and semi-spherical, in the axils of the ordinary leaves. Bracts $\frac{1}{2}$ to $\frac{3}{4}$ inch,

linear, lanceolate, one-nerved, ciliate. Calyx-tube slightly shorter: mouth quite straight with erect hairs of $\frac{1}{8}$ inch, and slightly longer linear ciliate teeth. Corolla exserted, upper lip hooded rich brown, lower white.

Pulneys: on the open hill sides above Silver Cascade, etc., Kukal, and at lower levels but not seen on the higher downs. Not collected on Nilgiris. *Fyson* 330. *Bourne* 89, 240, 1339, 3018.

Gen. Dist. Pulney and Mysore hills.

TEUCRIUM.

F.B.I. 112 LIII.

Wood Germander.

Herbs or shrubs with whorls in two to six-flowered axillary or terminal spikes, racemes or heads, with the characters of the family and tribe 5 *AJUGOIDEÆ* (p. 321), and peculiar in having no upper lip, but in its place a notch through which are exserted the four long curved stamens, a large lower lip with minute or obsolete side lobes and large mid-lobe, and minute nutlets with comparatively very large hilum. Calyx with ten ribs and five nearly equal teeth.

Species about 100, mostly in temperate and southern Europe. In England 3 species.

Teucrium wightii Hook. f.; *F.B.I.* iv 701, LIII 6. Wight's Germander. A stout stemmed herb with soft rather thick leaves and pale purple flowers in long spikes terminating the upper axillary branches, and so forming large terminal panicles.

Stem stout, four-angled, covered with soft white deflexed hairs. Leaves ovate-obtuse, soft, rather thick, deeply impressed on the upper side by the closely reticulate venation, shining, but covered below and above with hairs. Stalk $\frac{1}{8}$ to $\frac{1}{4}$ inch. Flowers in whorls of two facing alternately to half right and half left.

forming a compound, more or less one-sided spike: bracts elliptic acute: pedicels $\frac{1}{5}$ inch, slender. Calyx and inflorescence purple, but covered densely with greenish gland-tipped yellow hairs; upper tooth larger than the others, lower acute. Corolla pale purple: tube short: lower lip spreading forwards and upwards; mid-lobe partially covering the ovate lateral, below these another pair of triangular lobes. Stamens erect and curving forwards, white or pinkish: anthers light brown dehiscing by a vertical slit. Nutlets roundish with a large lateral scar. t. 224. *a* corolla, etc.; *b* calyx showing nutlets and hairs inside the tube [*E.T.B.*]; *c*. nutlet [*F.*].

In rocky places. Nilgiris: on Dodabetta and near Ootacamund, flowering from March to June. *Fyson 2024*. Not apparently elsewhere.

PLANTAGINACEÆ.

A family of practically only one genus, of about 200 species; the two other genera having but one species each.

PLANTAGO.

F.B.I. 113 I.

Annual or perennial herbs and shrubs with usually radical leaves, and spikes of small flowers on long leafless stalks (scapes), peculiar in having a scarious monopetalous corolla with four small lobes, and a thin-walled egg-shaped capsule which opens by a circular transverse slit. Sepals four, imbricate. Stamens four with long filaments and round anthers, attached to the middle of the corolla tube. Ovary superior two-celled, with one or more ovules. Seeds angular subglobose or compressed, plane or concave on the hilum side. Embryo straight, radicle pointing downwards.

Species 200, all over the world, chiefly in temperate climates; but not absent from hot dry countries nor from the tops of mountains. In England 5 species, Plantain, Ribwort, Waybread; *Ger. Wegerich, Wegetritt*.

Plantago major Linn. ; *F.B.I.* iv 705, 11 ; Waybread. Perennial by a stout rootstock. Leaves all radical, stalked, oblong or oblong-ovate, very variable in size, from blades of $1\frac{1}{2}$ by $\frac{3}{4}$ inch with stalks $\frac{3}{4}$ inch, to blades 4 by 3 inches with stalks 8 inches, entire or toothed, three-to five-nerved. Spikes long and slender, 1 to 8 inches. Flowers scattered or crowded. Bracts variable as long as or shorter or longer than the $1/12$ -inch sepals. Capsule $1/6$ to $1/5$ inch, egg-shaped. Seeds small black, attached to the top half. t. 225.

In waste places and road-sides as a weed. *Fyson* 12, 1445. *Bourne* 104, 5098.

Gen. Dist. In the cooler parts of India, and wild or introduced in many temperate climates.

In t. 225 : *a* flower ; *b* fruit opened, showing the seeds adhering to the top part. [*E.T.B.*].

PHYTOLACCACEÆ.

A family of 20 genera and 60 species, in tropical and temperate climates.

PHYTOLACCA.

F.B.I. 118 I.

American Nightshade, Pokeweed.

Glabrous trees and shrubs with alternate entire leaves, and racemes of flowers with bract and bracteoles, four or five sepals, no petals, five to twenty-five stamens and five to ten carpels, more or less united, and in fruit fleshy, each with one seed containing a curved embryo.

Species 2 in tropical and sub-tropical regions.

Phytolacca dioica Linn. ; v 21, 12 ; Pokeweed. A coarse shrub. Leaves stalked, ovate acute, drying yellowish, varying much in size and a little in shape. Spikes drooping, peduncled above the last leaf : pedicels $\frac{1}{4}$ inch : bracts $\frac{1}{8}$ inch. Sepals $\frac{1}{8}$ inch. Stamens many

(less than twenty). Fruit of five black fleshy carpels arranged radially.

Native of South America (Paraguay, etc.) but introduced as a garden plant, and occasionally found as an escape near Ootacamund and near Kodaikanal. *Fyson* 1852. *Bourne* 5095. Previously recorded in India near Calcutta.

POLYGONACEÆ.

Buck-wheat, Rhubarb, Dock, Sorrel, etc.

Herbs with alternate leaves, peculiar in having a thin tubular stipule sheathing the stem (and covering the young leaf-bud). Flowers jointed to the pedicels. Perianth of three to six parts, which persist till the fruit is ripe and may or may not be separable into an outer set (sepals) and an inner (petals). Stamens five to eight, opposite the perianth segments. Ovary superior, angled, with one basal erect ovule, almost peculiar in having the micropyle at the opposite end to the point of attachment. Fruit a nut usually enclosed in the perianth, with floury or bony endosperm.

Genera 30, species 600 chiefly in temperate regions.

- | | | | |
|---|---|--|------------|
| a | { | Stamens nine: stigmas fimbriate: sepals in fruit much thickened in the centre and fringed with hooked hairs. | RUMEX. |
| | | Stamens one to eight: stigmas capitate. | |
| b | { | Nut enclosed in the perianth segments: cotyledons flat . . . | POLYGONUM. |
| | | Nut longer than the perianth: cotyledons plaited | FAGOPYRUM. |

POLYGONUM.

F.B.I. 119 III.

Knot-grass, Persicaria, etc.

Herbs or undershrubs of various habit, with alternate leaves, swollen nodes, and usually large tubular stipules. Flowers small in clusters at the axils and nodes of the

inflorescence, in the axils of sheathing or concave bracts. Perianth segments five, stamens eight. Stigmas three, capitate. Nut biconvex or three-angled, enclosed in the slightly enlarged, occasionally fleshy, perianth. Embryo more or less to one side of the nut, with narrow cotyledons.

Species 200. Almost all over the world. *Fr.* Renouée.
Ger. Knöterich.

More or less prickly water-plants *P. strigosum*.
Large almost shrubby plants with oval leaves and two ear-like appendages at the base of the stalk . . . *P. chinense*.
Annual wayside weed of 6 to 18 inches *P. alatum*.

***Polygonum alatum* Hano.;** *F.B.I.* v 41, III 41. An annual herb. Stems and branches sometimes weak near the base and rooting at the lower nodes, 6 to 18 inches. Stipule $\frac{1}{4}$ to $\frac{1}{3}$ inch, tubular at the base, widening to a very oblique mouth. Leaves ovate deltoid, narrowed to the short clasping stalk. Peduncles slender. Clusters subtended by a small leaf (or large leaf-like bract): bracts of the flowers acute. Nut biconvex or trigonal.

Road-side and garden weed. Ootacamund, etc. Kodai-kanal. Flowering after the rains. *Fyson* 1847, 2646, 2083,* 2593. *Bourne* 708, 5203.

Gen. Dist. Mountains of India, Ceylon, Afghanistan, Java, Japan, Abyssinia.

***Polygonum chinense* Linn.;** *F.B.I.* v 44, III 48. Almost shrubby. Stem tall stout, branched, glabrous. Stipular tube $\frac{3}{4}$ to 1 inch, with long wavy point. Leaves 3 to 5 inches, ovate-oblong, acuminate, finely serrate: stalk $\frac{1}{4}$ to 1 inch, with two ear-like expansions at the base. Ultimate peduncles divaricate, covered with short glandular hairs. Clusters $\frac{1}{4}$ to $\frac{1}{3}$ inch. Flowers usually white with a little pink, also pink or purplish. Nuts

variable, in a dry or a fleshy perianth. Wight Ic. t. 1806.

Very common in the rich cool soil of woods, and as a garden weed. *Fyson* 58, 3082. *Bourne* 10, 2365.

Gen. Dist. Mountains of India, Burma, Ceylon, Malay islands, China, Japan.

Miss Edwards of the Lawrence Memorial High School tells me that some flowers never open and it is these which produce the flesh-covered nuts.

***Polygonum strigosum* Br. ; F.B.I. v 47, III 53.** Stem 1 to 3 feet, prickly (much or little), as also are the leaf-stalks, nerves and peduncles. Leaves 2 to 4 inches, oblong acute or lanceolate, usually glabrous above, and also below except for the prickles: stalk $\frac{1}{4}$ inch. Racemes $\frac{1}{4}$ to $\frac{1}{2}$ inch, on slender peduncles of $\frac{3}{4}$ to 2 inches. Bracts ovate or oblong, fringed with hairs. Stamens six to eight. Nut black, three-angled.

In water and in wet places. Ootacamund by the lake side. *Fyson* 670. *Bourne* 696.

Gen. Dist. Mountains of India and across to China.

FAGOPYRUM.

F.B.I. 119 IV.

Buck-wheat.

Similar to POLYGONUM except for the nut being longer than the encircling perianth (which is not enlarged in fruit), and the cotyledons very broad and folded and curled round the radicle.

Species 2, temperate Europe and Asia, cultivated everywhere.

***Fagopyrum esculentum* Mærch ; F.B.I. v 55, IV 1.** Common Buck-wheat.

Annual. Stem $1\frac{1}{2}$ to 2 feet, glabrous, hollow. Stipular tube about $\frac{1}{8}$ inch, with longer point. Bud 1 inch, slender, acute. Leaf-stalks $1\frac{1}{2}$ inches, blades broadly, triangular-cordate; upper narrower. Flowers nearly sessile, along the branches of terminal cymose

corymbs, pink or white. Nut $\frac{1}{4}$ to $\frac{1}{3}$ inch, ovate with acute angles. t. 226.

A road-side weed at Ootacamund. Cultivated on the Nilgiris, Himalayas, Khasi hills, in Thibet and in temperate North America. *Fyson* 1809, 2002. *Bourne* 4626. *Fr.* Blé noir. *Ger.* Buckweizen.

RUMEX.

F.B.I. 119 VII.

Dock, Sorrel, etc.

Perennial, rarely annual, herbs with alternate often radical leaves and small flowers in clusters at the axils or nodes of the inflorescence branches; and characterised chiefly by the perianth being of six parts, three outer and three inner; the former remaining unchanged, the latter in fruit enlarged, and one or more often much thickened. Stamens nine. Nut three-angled: embryo to one side, bent, with narrow linear or oblong cotyledons.

Species 100 all over the world.

Rumex nepalensis Spreng.; *F.B.I.* v 60, VII 5. Root-stock covered with dead and dried roots, leaf-bases, etc. Stem erect, repeatedly forked. Leaves ovate oblong, acute with abrupt base, finely toothed, nearly glabrous: upper leaves sessile, lower stalked. Flower-clusters in the axils of leaves which become towards the top small bracts. Flower $\frac{1}{8}$ inch. Fruit $\frac{1}{5}$ inch: inner perianth segments fringed with long hooked teeth. t. 227.

Road-sides, etc. Pulneys: near Kodaikanal. Nilgiris: Ootacamund. *Fyson* 1810, 2079.

Gen. Dist. Temperate hills of India, Asia Minor, South Africa, Java

Rumex acetosella Linn.; *F.B.I.* v 61, VII 10; Sheep-sorrel. Stems erect, branched from the base or simple, often reddish, slender. Leaves variable, from $\frac{1}{2}$ to 2 inches, stalked, oblong-elliptic, acute, with or without a pair of narrow divergent lobes near the base of the blade: stipules small, silvery. Flower-clusters in slender

erect interrupted spikes of 2 to 5 inches in length. Male flower larger than female. Fruiting sepals erect, closely appressed to the small three-gonous nut.

A weed of cultivation, native of the north temperate regions. Pulneys : at Kodaikanal *Fyson* 279.

PIPERACEÆ.

Herbs or shrubs, sometimes climbing, with entire, often gland-dotted leaves and catkin-like spikes of minute, often unisexual, flowers which have each a bract but no petals or sepals, two to six stamens, and an ovary of one cell. Ovules one or more, erect, almost peculiar in having the micropyle at the opposite end to the point of attachment, and in the seed being filled mostly with the original tissue of the ovule (*perisperm*), the embryo sac (with its enclosed endosperm remaining small.

Genera 8, species (?) 1,000, chiefly in America.

PIPER

F.B.I. 124 II.

Pepper, etc.

Thin-stemmed plants climbing up trees to which they attach themselves by roots. Leaves alternate, stalked : those of the climbing stem often of a different size and shape from those of the spreading branches (as happens with many other root-climbers, e.g., the Ivy) : nodes usually much swollen. Spikes (or catkins) one to three inches long, opposite the leaves : mostly unisexual and in the wild species dicœcious. Bract $\frac{1}{30}$ to $\frac{1}{20}$ inch across. Stamens two or three, ovary with three small stigmas but no style, and one erect ovule, attached to the base with its micropyle pointing upwards. Fruit a 'berry with one seed filled mostly with *perisperm*

and having the embryo, in the embryo sac, at the upper end with its radicle pointing upwards.

The genus is supposed to consist of 400 or 500 species but there has been much confusion in the identification of many of them, for the only certain character, the shape of the bract, is always difficult, and, often in dried specimens impossible, to determine. The leaves vary considerably in shape and hairiness, according to the position on the plant itself and the amount of sunlight they are exposed to. Small and constant variations are also to be found, Dr. C. A. Barber informs me, between the plants of a species in one shola and those of the same species in another: but all of a species in the same shola are usually alike.

Those which may be found at these levels appear to be as follows:—

(i) Bracts, rounded free of the spike along their upper edges only and attached to it at the base and sides by decurrent margins. Spikes long and slender—the cultivated 'Pepper'—usually below 5,500 feet *P. nigrum*.

(ii) Bracts circular, attached by the middle, with their margins free all round. Female spikes $\frac{3}{4}$ inch long only: male spikes 1 inch erect. (Common Pepper of Longwood shola, Kotagiri) *P. brachystachyum*.

(iii) Bracts oblong or angular, fitting close between the berries, with margin free all round. (Common Pepper of Ootacamund and Kodaikanal) *P. schmidtii*.
(including *P. wightii* of F.B.I.)

Piper brachystachyum Wall., Cat. 6656 *J.D.H. ms.!*; *F.B.I.* v 87, II 24. Peculiar in its very short nearly globular female spikes.

Leaves on the climbing stem broadly ovate, cordate, cuspidate, about $1\frac{1}{4}$ inches wide, and as long or slightly longer: stalks as long. Leaves of the free branches narrower than long, elliptic, with acute base and bluntly acuminate or cuspidate apex; nerves four, a pair of opposite ones leaving the midrib near the base, two others not opposite each other leaving it below the middle. Bracts circular, attached by the centre with margin free all round. Male spikes 1 to 2 inches, slender erect very

numerous. Female spikes $\frac{1}{4}$ inch, erect, in fruit $\frac{3}{4}$ inch. t. 228. Wight Ic. t. 1931 (*Clavica sphærostachya*).

Nilgiris : Ootacamund, Lovedale, Kotagiri (abundant in Longwood shola, flowering chiefly in May and June). Pulneys : near Kodaikanal in sholas below the Church Cliff and Pambar House. *Fyson* 383, 1885, 1814, 1750, 1867, 1755, 1757. *Bourne* 269, 2374.

Piper schmidtii Hook. f. (*ms. at Kew!*) ; *F.B.I.* v 89, II 30 ; including *P. wightii* Miq., *F.B.I.* v 94. Stems as thick as the finger. Leaves alternate in a one-fourth spiral, each opposed by a spike or the scar of one : stalk $\frac{1}{3}$ to $\frac{3}{4}$ inch, curved always to bring the blade horizontal. Blade ovate-elliptic, often lop-sided ; upper side dark green and glossy ; lower very pale to white ; quite firm or coriaceous. Nerves one pair from near the base, another pair from further up on the midrib, occasionally another fainter marginal pair from near the base : venation a coarse network, impressed on the upper side, prominently raised on the lower. Male spikes 1 to 3 inches, with stalk of $\frac{1}{2}$ to $\frac{3}{4}$ inch, pendent : bracts circular with free margin : stamens usually two, with thick filaments and anthers opening by vertical cross slits. Female spikes 2 to 3 inches ; in fruit longer, curved more or less and even spirally twisted : bracts oblong with raised margin, free all round. Berries red or yellow. t. 229.

Nilgiris : near Ootacamund. Pulneys : near Kodaikanal the common Pepper of these levels. *Fyson* 1704, 1746, 1936, 1754, 2444, 2592, 2636. *Bourne* 107, 270, 1745.

Piper nigrum Linn. ; *F.B.I.* v 90, II 34 ; common Pepper. Male and female spikes both long and slender : bracts oblong decurrent on the spike and free only at the upper end, in fruit cup-shaped. Leaves ovate-acute, coriaceous, quite glabrous : nerves one pair of opposite ones near the base, two others not opposite from higher

up the midrib running to the tips. Berry $\frac{1}{3}$ inch. Wight Ic. t. 1935.

Cultivated only, the Pepper of commerce.

PEPEROMIA.

F.B.I. 124 III.

Pepper-elder.

Succulent herbs with alternate opposite or whorled, entire exstipulate gland-dotted leaves, and terminal or leaf-opposed spikes of small flowers imbedded in them. Stamens two with confluent anther-cells. Ovary with no style, but a sessile fringed stigma and containing a single erect ovule. Distinguished from *Piper* by the minute, not fleshy fruit, the anthers and the distinct stigmas.

Species 400, in hot climates of both Old and New World.

***Peperomia reflexa* A. Dietr. ; F.B.I. v 99, III 10.**
A small glossy herb common on the branches of trees. Stem weak, rooting at the nodes. Leaves in fours, $\frac{1}{4}$ to $\frac{1}{2}$ inch, ovate, succulent. Spikes terminal, erect, $\frac{1}{2}$ to 1 inch. t. 230. Wight Ic. t. 1933.

On trees whenever damp, very common. *Fyson* 6166. *Bourne* 215.

Gen. Dist. Himalayas, Khasia, South Indian hills, Burma, China, Australia, Africa, America.

In t. 230. *a* part of spike showing flowers sunk in the hollows ; *b* male flower ; *c* female flower ; *d* fruit.

LAURINEÆ.

Aromatic shrubs or trees with nearly always alternate and evergreen, gland-dotted, exstipulate, simple leaves. Flowers small variously arranged in axillary cymes panicles, or racemes, or often in clusters surrounded and enclosed in bud by concave bracts. Perianth a tube with usually six lobes, not obviously separable into sepals and petals. Stamens typically twelve, in four whorls of

three each, but the innermost whorl sometimes reduced to staminodes: some or all of the filaments with a pair of large yellow excrescences (glands) near the base: anthers oblong, opening not by slits or pores but by lateral holes closed by flaps ('trap-doors') opening upwards. Ovary superior in the base of the perianth tube, with one anatropous ovule suspended from the top, its micropyle upwards. Fruit fleshy or dry, seated often in the cup-like enlarged perianth. Embryo with plano-convex fleshy cotyledons and minute radicle.

Species 900, mostly in the tropics.

- | | | | |
|---|---|--|------------|
| a | { | Leaves in whorls of four or five, separated by 3 to 6 inches. | |
| | | Leaves all scattered (alternate) | b |
| b | { | Flowers small clustered inside an involucre of bracts | c |
| | | Flowers in open racemes or panicles | |
| c | { | Leaves three-nerved from the base, fruit $\frac{1}{2}$ inch on a shallow cup | NEOLITSÆA. |
| | | Leaves penninerved, fruit on a cup as deep as wide | LITSÆA. |

CINNAMOMUM.

F.B.I. 128 VII.

Cinnamon.

Trees and shrubs with aromatic bark and firm, opposite or alternate, three-nerved leaves. Flowers in axillary or subterminal panicles with short perianth tube and six equal lobes, nine perfect stamens, those of the two outer whorls without glands and with anthers opening inwards, those of the inner whorl with a gland on each side and extrorse anthers; and inside these again a fourth whorl of capitate or shortly sagittate staminodes. Ovary sessile, narrowed upwards to the style. Stigma discoid. Berry seated on the enlarged perianth tube.

Species about 54, in tropical and sub-tropical Asia, Japan, tropical Australia.

Cinnamon is now obtained from the bark of *C. zeylanica* Nees, a native of Ceylon. Camphor is obtained from *C. camphora*, mainly in Formosa.

Cinnamomum wightii *Meissn.*; *F.B.I.* v 132, VII 15; Wight's Cinnamon. A small, or in the shola, quite large tree, with trunk $2\frac{1}{2}$ feet thick at 4 feet and spreading out below. Foliage light green, shiny. Branchlets green, four-angled and grooved, nearly glabrous; older round, smooth, with a few lenticels. Leaves opposite or alternate, strongly three-nerved, very fragrant when crushed: stalk $\frac{1}{2}$ to $\frac{3}{4}$ inch thick: blade broadly elliptic, ovate or obovate, up to 4 by 3 inches, quite glabrous, entire; upper side shiny, lower dull; with three strong nerves starting from near the base and reaching to near the tip, and much smaller veins in a fine network. Flowers in open panicles in the upper axils. Peduncle of panicle $1\frac{1}{2}$ inches; lower branches in the axils of thick bracts $\frac{1}{8}$ inch, upper bracts absent or deciduous. Pedicel about $\frac{1}{8}$ inch, thickening gradually to the $\frac{1}{5}$ inch bud, which is thus club-shaped. Sepals three, and petals three, exactly alike, $\frac{1}{8}$ inch, covered outside and in with a fine close silky pubescence. Outer sepal-stamens with thick anther, opening inwards by four small valves; facing these a set with anthers opening outwards, and at the base of the short filament a pair of round yellow bodies. Petal-stamens like the outer sepal-stamens; facing them a set of yellow, sagittate staminodes: all more or less pubescent. Ovary half sunk in the depressed centre, three-angled. Fruit globose on the thickened and enlarged perianth. But in place of this there is often a soft body like a small, brown rough-skinned apple, $\frac{1}{2}$ to $1\frac{1}{2}$ inches by $\frac{1}{2}$ inch, flattened on top, on a broadened stalk with a black central mark, $\frac{3}{16}$ inch across, and stylar scar of $\frac{1}{16}$ inch; this is a gall.

Nilgiris: in sholas common. In Ootacamund, directly opposite Rosemount. Flower in the early part of the year, fruit December. Pulneys: not seen near Kodaikanal but at lower levels. *Fyson* 2017, 2633, 3084. *Bourne* 248.

Gen. Dist. These hills only.

Note on the flora mechanism. The large yellow excrescences ('glands') at the base of the stamens form a barrier against entrance to the base of the flower except between them. I could find no honey at the base of the flower, but in newly opened flowers the hastate staminodes of the innermost whorl, glisten and taste of honey: they are probably therefore the honey-secreting organs. The anthers and their stiff filaments stand well back against the perianth tube, and the proboscis of an insect inserted down the middle of a flower would touch first the stigma, depositing on it any pollen it might bring, and then these sticky honey-glands (staminodes). On being withdrawn the proboscis would rub up against the petal-stamens which have stiff filaments and anthers, and opening the trap-doors over the pollen sacs remove pollen because sticky with honey. These outer petal-stamens appear to mature first. The pollen grains of the petal and sepal-stamens appear to be quite similar, and as the third whorl open outwards facing the first and second, the pollen from them is probably removed in the same way.

The young shoots are stiffly erect with the young leaves, yellowish-pink or brownish-pink, hanging vertically down from their stalks. This is very characteristic and similar to what happens in *ACTINODAPHNE*.

ACTINODAPHNE.

F.B.I. 128 XI.

Evergreen shrubs and trees with whorled leaves and small flowers in axillary or lateral, dense, bracteate umbels or clusters. Perianth tube short, segments six. Stamens nine; outer six without glands, inner three with glands: all anthers facing outwards. Fruit seated on the much enlarged perianth.

Species 50 in eastern Asia and Malaya.

Actinodaphne hookeri Meissn.; *F.B.I.* v 149, XI, 9. A small tree: lateral branches often slender, erect; all parts tomentose. Leaves in whorls of four or five: stalks $\frac{1}{2}$ inch, densely tomentose on the underside, elliptic lanceolate, penninerved. Male flowers clustered; female umbelled or subracemose on a short stout peduncle. Fruit ellipsoid seated on the much thickened sub-campanulate entire perianth tube.

Pulneys: in sholas near Kodaikanal. My specimens being imperfect I give this name under reserve. It may prove to *A. lanata* Meissn. *Fyson* 2133, 2177. *Bourne* 517.

LITSÆA.

F.B.I. 128 XII.

Trees with alternate leaves and small unisexual flowers clustered in a globose involucre of four or five bracts, which at length opens. Perianth tubular with usually six lobes. Stamens of male flowers nine or twelve, those of the two inner whorls with glands on the filaments. Fruit a berry seated on, and more or less sunk in, the enlarged perianth (like an acorn in its cup).

Species about 100, in tropical and sub-tropical Asia and Australia.

Litsæa wightiana Wall., *Cat.* 2557!; *F.B.I.* v 177, XII 59. A fair sized tree. Leaves alternate varying from 2 or 3 inches, elliptic, acute or obtuse, and narrowed to the stalk, to 6 by 2 inches, oblong-lanceolate acute, very firm and coriaceous, glossy on the upper surface where the nerves are impressed, pubescent and tomentose and, with prominently raised nerves on the under margin, entire, revolute: stalk $\frac{1}{2}$ inch. Spike of flower-heads 2 inches, rusty-tomentose. Heads peduncled $\frac{1}{5}$ to $\frac{1}{3}$ inch, spherical in bud: bracts four, very concave and firm. Perianth tube $\frac{1}{6}$ inch, narrow-egg-shaped: lobes six, silky tomentose. Stamens about twelve, the six outer longer and without glands. Female flowers with similar staminodes. Stigma large and bushy. Fruit oblong, pointed at each end.

In sholas, common on both plateaus. *Fyson* 550, 1695, 1725, 1728, 2056, 2064, 2209, 2231, 2489.* *Bourne* 272, 1497, 2044, 4656.

Gen. Dist. South India.

Considerable variation occurs in the size and shape of the leaves.

NEOLITSÆA.

128 XII.*

Formerly included in LITSÆA but differing from that genus; as now defined, by the leaves being three-nerved at the base, the perianth segments four, and stamens six,

Fruit seated on the flat or slightly saucer-shaped perianth.

Neolitsæa zeylanica Merrill; *F.B.I.* v 178 as *LITSÆA*, XII 63; Tallow tree.

A small tree, glabrous. Leaves elliptic or elliptic-lanceolate, acute at both ends, prominently three-nerved at the base, but with fainter nerves beyond the middle: lower surface impressed with very fine white reticulation or rounded pits. Buds enclosed in scaly bracts, young leaves silky. Flower-clusters, in bud $\frac{1}{6}$ inch, in dense masses at the leaf-axils. Perianth tube $\frac{1}{8}$ inch, broadening to the lobes, silky. Fruit globose, $\frac{1}{3}$ to $\frac{1}{2}$ inch, seated on a shallow cup $\frac{1}{6}$ inch across.

Nilgiris: on Elk hill near Ootacamund very abundant. Kotagiri, Coonoor, etc. Flowering December. Pulneys. *Fyson* 452, 1733, 1470, 2018.* *Bourne* 1157, 2027.

Gen. Dist. Western end of the Himalayas, South India from sea level at Quilon to 7,000 feet, Burma, Malay Peninsula, Ceylon.

A form on the Pulneys has oblong fruits. *Bourne* 399.

THYMELEACEÆ.

EUTHYMELEÆ.

tribe.

Daphne, Spurge-laurel.

Shrubs or trees with simple entire leaves, and clusters, spikes or racemes of flowers, with simple tubular perianth having four or five lobes, and sometimes near the mouth also scales, two or ten stamens attached at varying heights inside the tube, a superior one-celled ovary and indehiscent fruit.

Genera about 40. Species 360 in temperate and tropical climates.

LASIOSIPHON.

F.B.I. 130 VII.

Shrubs with slender twigs, opposite or alternate leaves and dense terminal heads or clusters of silky-woolly flowers, whence the name (*lasios* soft, *siphon* tube).

Species 26, in South Africa, torpical Africa, Madagascar and tropical Asia.

Lasiosiphon eriocephalus Decaisne ; *F.B.I.* v 197, VII

1. A small tree or shrub, much and loosely branched : branches very rough and scarred across ; twigs glossy, vandyke brown, or at the tips green. Leaves 1 to 3 by $\frac{1}{4}$ to $\frac{3}{4}$ inch, elliptic or oblanceolate acute, nearly sessile, rounded at the base, entire, glabrous : midrib prominent ; veins very slender, numerous and much reticulated. Heads of flowers terminal, nearly globular $1\frac{1}{4}$ inches. Pedicels $\frac{1}{10}$ inch, green silky. Tube of flower $\frac{1}{2}$ to $\frac{3}{4}$ inch, yellow, densely clothed at the base by erect white hairs $\frac{1}{5}$ inch long, enlarged here but narrower above, then slightly wider below the five lobes : lobes $\frac{1}{8}$ by $\frac{1}{20}$ inch, spreading, woolly outside, light brown and nearly glabrous within : scales between the lobes five, much smaller, $\frac{1}{16}$ inch, glabrous, very variable in shape. Anthers $\frac{1}{12}$ inch, attached at different levels inside the perianth tube, and opening inwards. Ovary slender, thickened at the middle, covered like the perianth tube with coarse erect hairs, one-celled. Wight Ic. tt. 1859-60.

In sholas : Nilgiris on the borders of our area, e.g., below Pykara at 6,800 feet, Neduwattum, Coonoor, etc., flowering early May ; but not near Ootacamund. *Fyson* 2244, 1161, 3089. Pulneys : Poombari, but not at highest levels. *Bourne* 1161.

Gen. Dist. South India and Ceylon.

ELÆAGNACEÆ.

A small family of about 15 species nearly all belonging to one genus.

ELÆAGNUS.

F.B.I. 131 I.

Trees or shrubs, often straggling, peculiar in being covered all over the twigs and backs of the leaves with numerous flat silvery or brownish shiny scales, attached by their centres. Leaves quite entire, alternate or

opposite. Flowers shortly stalked, solitary or in clusters at the leaf-axils, without bracts. Perianth single enclosing the ovary and prolonged above it in a short tube ending in four small deciduous lobes. Stamens four. Ovary one-celled, with one basal erect ovule: style shorter than the perianth tube so that the stigma is enclosed in it. Fruit indehiscent.

Species about 12, in south Europe, temperate and tropical Asia, Australia, North America.

Elæagnus latifolia Linn.; *F.B.I.* v 202, 1 4. Very variable in habit, from an undershrub of 2 or 3 feet to a straggler climbing up and over tall trees to 60 feet, or a 'tree with trunk 6 inches thick': often with spiny branchlets at right angles to the main branches. Leaves often directed backwards along the branch, ovate-oblong, elliptic or roundish, firm. Flowers subsessile in clusters of four or five at the leaf-axils, forming large clusters near the ends of the branches. Perianth tube $\frac{1}{4}$ inch: lobes $\frac{1}{20}$ inch, hairy inside. Anthers sessile at the throat. Style half the tube. Fruit linear oblong, $\frac{3}{4}$ to $1\frac{1}{2}$ inches, with eight ribs, red, fleshy with a pleasantly acid taste. t. 231.

Very common in all the sholas of both plateaus flowering winter months. *Fyson* 1748, 2208, 2235. *Bourne* 271.

Gen. Dist. Mountains of India, Ceylon, Burma, Malay islands, China. In t. 231: *a* flower split and opened flat to show anthers; *b* immature fruit with flower still attached.

LORANTHACEÆ.

Parasitic evergreen shrubs—species 520 in 13 genera, and 520 species LORANTHUS and VISCUM being the most important.

LORANTHUS.

F.B.I. 132 I.

Evergreen woody plants parasitic on the branches of trees, with entire and usually opposite and thick, yellowish

or brownish-green leaves. Flowers in cymes or racemes, with concave or obliquely cup-shaped bract and two bracteoles: perianth double: ovary inferior crowned by the small calyx-teeth. Petals four to six, combined into a short or long tube split down one side, the free parts (corolla-lobes) bent outwards and down against the tube. Stamens attached to the base of the lobes. Ovary before fertilization solid, or with a slightly looser tissue in the centre, but with no clearly marked ovule: style single and stigma undivided. Fruit an egg-shaped berry or drupe crowned by the calyx-teeth, with very sticky pulp, and a single seed rather to one side, without seed-coat but with a quantity of endosperm and straight embryo, the radicle pointing upwards.

Species above 300, of various habit, in Africa, Asia and Australia, nearly all in tropical regions only.

The plant lives by sending suckers, through the bark and into the young wood and phloem of the branch it is seated on. From the host-tree are absorbed water and a certain amount of ready-made food products: but a certain amount of assimilation is no doubt done by the leaves, in which the chlorophyll is partially developed. The fruits are dispersed by birds, which find the seeds sticking so firmly to their beaks that they are compelled to sit (on a branch) to clean them off. By this means the seeds are planted on fresh trees. On germination the radicle pushes out and into the bark. Dr. Barber tells me that the seeds of the different species may readily be distinguished.

- | | | | |
|---|---|---|---------------------------|
| a | { | Flowers under one inch, in lateral racemes: leaves broad | <i>L. obtusatus.</i> |
| | | Flowers in dense cymose bunches, scarlet: leaves lanceolate | <i>L. neelgherrensis.</i> |
| | | Flowers in sets of two or three, peduncled or sessile, at the leaf-axils. | b |
| b | { | Leaves alternate but usually in bunches, obovate $\frac{1}{2}$ to $1\frac{1}{2}$ inches | <i>L. cuneatus.</i> |
| | | Leaves opposite | c |
| c | { | Flowers one inch, very slender | <i>L. memecylifolius.</i> |
| | | Flowers 1 to $1\frac{1}{2}$ inches, trumpet-shaped. | <i>L. loniceroides.</i> |

***Loranthus obtusatus* Wall., Cat. 526!; F.B.I. v 205, I 6.** Characterised by its broad leaves and dense spikes of slender erect flowers. Branches robust. Leaves 3 to 4 by 2 to 3 inches, ovate obtuse, very firm, quite glabrous;

nerves slender: stalks $\frac{1}{2}$ to $\frac{3}{4}$ inch. Spikes on the lower and now leafless parts of the branches in the axils of the fallen leaves, 2 to 4 inches, pendulous. Pedicel $\frac{1}{8}$ inch: bract $\frac{1}{20}$ inch: bracteoles absent. Ovary $\frac{1}{10}$ inch. Corolla $\frac{3}{4}$ inch, in bud club-shaped, splitting eventually almost to the base into five, fairly straight petals; red in the lower part, yellowish above; always standing erect even when the raceme hangs down. Fruit $\frac{1}{4}$ inch.

Nilgiris: at the lower limits of our area. Kotagiri, Neduwattum. Pulneys: in sholas on the downs. *Fyson* 1750, 2731. *Bourne* 1507, 1402, 1162, 1162.*

Gen. Dist. Deccan hills.

***Loranthus cuneatus* Heyne**; *F.B.I.* v 214, I 31. Distinguished by its alternate, small, wedge-shaped, erect, often clustered leaves and its slender, curved, yellowish green flowers. Branchlets slender. Leaves $\frac{1}{2}$ to $1\frac{1}{2}$ inches, obovate cuneate, very obtuse, alternate but frequently in bunches of three or four by development of those of the axillary buds, glabrous, one-nerved, always erect. Flowers two or three together, in bunches at the leaf-axils, on stalks of $\frac{1}{8}$ inch: bract small: no bracteoles. Calyx-tube or ovary, $\frac{1}{12}$ inch. Corolla 1 inch; lobes $\frac{1}{3}$ to $\frac{1}{2}$ inch, slender, reflexed. Anthers linear. Fruit $\frac{1}{4}$ inch, surmounted by the small calyx-teeth. t. 232.

Nilgiris: abundant near Coonoor and Kotagiri on *Dodonæa viscosa*; near Ootacamund. Pulneys: not collected from the downs but at lower levels. *Fyson* 663, 1710,* 2085. *Bourne* 4654, 2079, 657.

***Loranthus neelgherrensis* Wight and Arnott**; *Herb. Wight* 261; *F.B.I.* v 216, I 40; Scarlet L. Easily recognised here by the dense bunches of slender crimson-scarlet flowers. Stem as thick as the finger: bark brown, with wide-gaping cracks (? extra-large lenticels): nodes swollen: youngest branches round, red. Leaves

alternate, sub-opposite, or in threes, lanceolate to ovate, entire, quite glabrous, leathery and tough: midrib slightly raised on both sides: nerves obscure. Flowers in crimson scarlet umbels or short corymbose spikes, on short peduncles of $\frac{1}{4}$ inch, bunched in the axils of, mostly, fallen leaves. Pedicel $\frac{1}{10}$ inch: bract $\frac{1}{30}$ inch: ovary $\frac{1}{12}$ inch, top-shaped, contracted below the very short entire calyx-limb. Corolla 1 inch, scarlet; tube $\frac{1}{3}$ inch, inflated at or below the middle; segments five, twice as long, separating first close above the tube, later curling back and turning an orange colour inside. Style light green with conspicuous red capitate stigmas. t. 233. Wight Ic. t. 1020, Sp. Nilg. t. 88.

In the figure: *a* withered corolla slipped off and still held by the style; *b* a full-grown bud; *c* opening bud; *d* fully opened flower; *e* bunch of fruits.

Nilgiris: Ootacamund to Neduwattum, flowering March. *Fyson* 2302.

Gen. Dist. Also Ceylon.

Loranthus memecylifolius *Wight and Arnott; Herb. Wight* 231; *F.B.I.* v 217, 141. Branchlets stout. Leaves alternate, thick and firm, oblong or elliptic, obtuse, narrowed to the very short stalk. Flowers three or more, on peduncles of $\frac{1}{8}$ inch, which are again in clusters of one to four at a node. Bract small: bracteoles absent. Corolla 1 to $1\frac{1}{2}$ inches, scarlet and yellowish; lobes slender. Anthers linear, longer than the filaments.

Nilgiris: near Ootacamund. Pulneys: Bearshola, Kodai-kanal; but mostly below our level, at 5,500 feet. *Bourne* 293, 161.

Loranthus loniceroides *Linn.; F.B.I.* v 221, 154. Distinguished among our species by the large flowers with three equal bracts, rich red reflexed petals, and long exerted stamens. Branches stout with wrinkled corky bark. Leaves opposite. Stalk $\frac{1}{2}$ inch. Blade ovate or elliptic-oblong, usually obtuse. Flowers in cymose

groups, on stout peduncles of $\frac{1}{4}$ inch. Corolla 1 to 2 inches, narrow funnel-shaped, curved, red: segments $\frac{1}{2}$ inch, reflexed, brilliantly red. Anthers slender. t. 234.

Nilgiris: near Ootacamund, Governor's shola, etc. Flowers December. *Fyson* 673. Pulneys: at lower levels.

Gen. Dist. South India and Ceylon. Previously recorded as reaching 6,000 feet only.

VISCUM.

F.B.I. 132 II.

Mistletoe.

Parasites like LORANTHUS on the trunks and branches of trees, but with forked branches, opposite leaves, and very small unisexual flowers with a single short perianth of three or four lobes. Fruit a berry crowned by the calyx-teeth, with very sticky flesh.

Species 60, in Europe, tropical and sub-tropical Africa, tropical and temperate Asia; some very widely distributed. The common Mistletoe of England, *V. album*, extending from England across Europe and Asia to Japan.

Viscum japonicum *Thunb.*; *F.B.I.* v 226, II II. Peculiar among all our plants in its round green leafless, segmented forked stems and branches, 1 to 5 inches long, made up round smooth segments $\frac{1}{5}$ to $\frac{1}{2}$ inch long. Leaves represented only by a pair of short opposite points at the joints between the segments. Flowers very minute in cup-shaped bracts at these nodes. Lobes three. Fruit sessile at the joints, $\frac{1}{12}$ inch, egg-shaped, with much sticky pulp, enclosing a rather flat seed with roughly hairy coat and minute shapeless embryo. *Wight* Ic. t. 1018, *Sp. Nilg.* t. 87.

On the downs—on *Eurya*, *Rhododendron*, *Microcarpa ovalifolia*, etc. *Fyson* 534,* 2746.* *Bourne* 298, 1059,* 1105.*

Gen. Dist. Higher mountains of India, Ceylon and Malaya, Mauritius, China, Japan, Australia.

SANTALACEÆ.

Sandalwood, etc.

Trees, shrubs or lowly herbs, some parasitic on the roots of other plants, with entire leaves and small greenish inconspicuous flowers, with a bract and two bracteoles. Perianth single of three to six parts. Stamens as many. Ovary inferior, of one cell with two or three ovules attached to a central column.

Species about 200 in tropical and temperate regions, dispersed widely all over the world.

The Sandalwood *Santalum album* is, economically, the most valuable species. Several of the smaller plants, e.g., species of *Thesium*, are parasitic on cereal plants, etc., and do some damage.

Small plant 3 to 6 inches, with linear leaves *THESIUM*.
 Bush with broad leaves *OSYRIS*.

THESIUM.

F.B.I. 133 I.

Slender perennial herbs, parasitic on the roots of other plants. Leaves alternate, narrow. Flowers small, greenish. Ovary inferior: perianth continued above it; lobes five, hairy. Stamens five. Ovules two or three. Fruit a small indehiscent nut, with one seed.

Species about 100, in temperate and tropical regions of the Old World. England has 1 Sp., the Bastard Toadflax, *Ger. Vermeinkraut*.

***Thesium wightianum* Wall., Cat. 4037!; F.B.I. v 230, I 2.** A small herb with slender short or straggling branches springing from a woody rootstock and linear yellowish green leaves $1/2$ by $1/12$ inch. Flowers axillary or terminal, white. Fruit spherical, $1/12$ inch, crowned by the perianth. Wight Ic. t. 1852, ex. anthers.

On the open downs in grass—common. *Fyson* 688. *Bourne* 2291, 4788.

Gen. Dist. Nilgiri and Pulney hill-tops.

OSYRIS.

F.B.I. 133 IV.

Shrubs with angular branches, alternate leaves and small unisexual flowers. Male flowers with three or four triangular lobes surrounding a thick disc, and four or five stamens. Female flowers with fully inferior ovary, short style, and a three or four-fid stigma. Fruit a globose drupe with globose seed.

Species 6, in south Europe, Africa, and India (one only).

Osyris arborea Wall.; F.B.I. v 232, IV 1; plant 8 inches, in dry poor soil, to 5 or 6 feet. Branchlets green, angular. Leaves ovate to elliptic-oblongate, mucronate, narrowed to the short stalk, yellowish green in colour. Male flowers $\frac{1}{8}$ inch, in axillary peduncled racemes or clusters. Female $\frac{1}{8}$ inch, solitary on axillary peduncles of $\frac{1}{5}$ inch. Fruit a yellow-orange-coloured berry, $\frac{1}{4}$ inch, showing the small calyx-teeth at the top. Wight Ic. t. 1853.

In sholas and on the downs, common. *Fyson* 389, 1120, 1861, 3086, 3087. *Bourne* 114, 2132.

Gen. Dist Higher mountains of India and Ceylon.

BALANOPHORACEÆ.

A family of fleshy root parasites with scales but not leaves, and unisexual flowers, with simple tubular perianth or often no perianth at all.

Genera 14. Species about 50 in tropical and sub-tropical regions.

BALANOPHORA.

F.B.I. 134 I.

Glabrous fleshy herbs, yellowish white or brown in colour with tuberous rootstock warty with numerous lenticels. Flowers massed in dense globular or egg-shaped heads or spadixes, on thick stalks, clothed at the base with large scales. Perianth of male flowers with two to six lobes, and a similar number of stamens.

Female flowers without perianth : ovary ellipsoid, one-celled with one ovule. Fruit a nut with crustaceous pericarp adhering to the seed. Seed globular, with copious oily endosperm. Embryo very small.

Species 11 in the Indo-Malayan archipelago, Australia and New Hebrides.

Balanophora indica Wall., *Cat.* 72471; *F.B.I.* v 237, 13. Rootstock massive very warty, brown. Peduncle 3 to 6 inches by $\frac{1}{2}$ to 1 inch, with large scales $1\frac{1}{2}$ to 2 by $\frac{1}{2}$ inch at the base. Male spadix 2 to 3 by 1 to $1\frac{1}{2}$ inches, red. Perianth tube $\frac{1}{2}$ inch; lobes $\frac{1}{4}$ inch, reflexed. Anthers connate into a thick mass $\frac{1}{5}$ by $\frac{1}{12}$ inch, and opening by vertical slits. Female flowers minute in a dense round ball.

On the surface of the ground near large trees. Nilgiri and Pulney plateaus, not rare. *Fyson* 3088.

Gen. Dist. These hills and Ceylon.

EUPHORBIACEÆ.

Herbs, shrubs or trees with alternate leaves and inconspicuous unisexual flowers (both sexes on the same or on different plants) in which there may or may not be a distinction of petals and sepals, and few or many stamens, but the ovary nearly always of three carpels and in fruit opening into its constituent carpels each with one or with two seeds. Micropyles always pointing upwards and outwards (*raphe ventral*) and more or less surrounded by a fleshy outgrowth (the *aril* or *caruncle*).

Species all over the world but practically confined to the tropics.

- | | | |
|-----|---|------------|
| a { | Flowers minute, of an ovary or a single stamen only, and massed in egg-shaped involucre | EUPHORBIA. |
| | Flowers distinct, and with perianth | b |
| | Sepals and petals three each : stamens three or six, more or less united | c |

- | | | |
|-----|---|----------------|
| b { | Sepals and petals two each : leaves three-nerved | SARCOCOCCA. |
| | Perianth segments three to eight. Leaves erect. Fruit a drupe | DAPHNIPHYLLUM, |
| c { | Herbs or shrubs with slender branches | PHYLLANTHUS. |
| | Trees | GLOCHIDION. |

EUPHORBIA.

F.B.I. 135 I.

Plants with milky juice and of very varied habit : from small leafy herbs, erect or creeping on the ground, to shrubs with green pencil-like leafless branches, to large succulent, ribbed and angular, spiny leafless plants of cactus-like habit, but clearly distinguished from that family by having simple stout horns, not slender spines intermixed with barbed hairs (as in the Prickly-pear). The apparent flower really a collection of small much reduced unisexual flowers each consisting of one jointed stamen only or one stalked ovary only, without petals or sepals : the former (male flowers) arranged in four or five double zigzag rows radiating from the centre where is the female flower. These all enclosed in a cup-shaped (calyx-like) involucre with four or five oval or crescent-shaped glands, which have often a white petal-like limb : the whole structure forming a unit, in outward appearance like a single flower, and called a *cyathium*. These cyathiums are variously arranged, solitary or in cymes, or bunches. Capsule splitting into three segments each opening to let out the solitary seed.

Species 600 in all except very cold climates. In Europe Spurge, Milkweed. The Cactoid species are mainly developed in South Africa.

Euphorbia helioscopia Linn.; *F.B.I.* v 262, I 44; Sun-spurge. Stem usually erect, not branched as a rule below the flowering region. Leaves sessile, obovate cuneate with finely toothed, round end, and very straight sides. Flower branches about five, from the axils of a whorl of

leaves : each branch again with three leaves and axillary rays, and these again forked. Cyathiums $\frac{1}{10}$ inch across : glands semi-circular or kidney-shaped. Capsule $\frac{1}{8}$ inch, its segments with rounded back. Seed acute, ovoid.

A weed, native of Europe, temperate Asia, Afghanistan, Punjab, Japan.

Nilgiris : Ootacamund and the downs to Lovedale, Coonoor, and Pykara. *Fyson* 3090. *Bourne* 2857, 4622.

Euphorbia rothiana Spr.; *F.B.I.* v 263, 149. Stem erect or weak at the base, becoming woody. Leaves narrow, erect, oblanceolate obtuse, narrowed to the base, two to four by $\frac{1}{3}$ inch, one-nerved, erect. Flowering branches three to five, long or short, bifid once or twice : if long with four or five pairs of bract-leaves, if short with one or two pairs only, and forking at these : these branch-leaves broader and shorter than the usual ones, ovate-triangular, $\frac{3}{4}$ by $\frac{1}{2}$ inch. Cyathiums $\frac{1}{8}$ inch across : glands two-horned. Capsule $\frac{1}{8}$ to $\frac{1}{6}$ inch, quite smooth. Very variable as regards size and shape of leaves and bracts, but remarkable for its numerous narrow erect leaves. Wight Ic. t. 1864.

In damp places. Nilgiris : near Ootacamund, Snowdon to Pykara. Flowers in June. Pulneys : at lower levels. *Fyson* 658, 3091. *Bourne* 4621, 232.

Gen. Dist. Hills of Central India, southwards to Ceylon.

SARCOCOCCA.

F.B.I. 135 II.

Glabrous shrubs with alternate, stalked, entire, leathery, leaves and short axillary spikes of male and female flowers, each with its bract and four sepals, two inner and two outer. Stamens of the male, as many, opposite the sepals, with thick filaments and oblong anthers which are eventually curved over backwards. Ovary, in the female, of two to three cells with two

ovules in each, differing from nearly all the rest of the family in the raphe being dorsal (micropyle pointing upwards and inwards). Fruit indehiscent. Seeds one or two with fleshy endosperm and broad cotyledons.

Species 2 to 5 in India and Malaya.

Sarcococca pruniformis *Lindl.* ; *F.B.I.* v 266, II 1. A shrub with smooth green branchlets, and dark green three-nerved glossy leaves. Male spike when fully open $\frac{3}{4}$ inch : stamens $\frac{1}{6}$ inch. Female spikes often on older branches, shorter. Fruit $\frac{1}{3}$ inch egg-shaped, surmounted by two small curved stigmas a little to one side of the top. t. 235. Wight Ic. t. 1877 (*S. trinervia*).

Nilgiris : very common at Ootacamund. Pulneys : at slightly lower levels. *Fyson* 542, 981, 1028, 3092. *Bourne* 175, 363, 434, 1770.

Gen. Dist. Temperate Himalayas, Khasia, Deccan ghats from Kanara southwards, Ceylon, Afghanistan, Sumatra.

PHYLLANTHUS.

F.B.I. 135 X.

Herbs or shrubs with entire usually small thin leaves, in two ranks all facing upwards. Flowers of both sexes usually on the same plant, with perianth of five or six parts separable into three sepals and three white and thinner petals. Male flowers with three round glands on the disc and three stamens with their filaments free or more or less united : anthers vertical, opening by slits. Female flowers also with disc glands and ovary of three cells, each with two ovules with ventral raphe : styles short, free or lightly connected. Fruit a rounded capsule.

Species about 500 in all the temperate and hot regions of both the Old and the New Worlds. Some have edible fruits, e.g., *P. emblica* (Amla, *Fr. Myrobalam emblic*) which is to be found wild or cultivated at slightly lower levels, on the Nilgiris.

Phyllanthus rheedii Wight, *Kew Dist. No.* 2588!; *F.B.I.* v 293, X 21. An undershrub and annual. Stem reddish slender, terete; branchlets angular. Leaves elliptic, apiculate, about $\frac{3}{4}$ by 1 inch, thin: stalk $\frac{1}{16}$ inch. Male flowers $\frac{1}{8}$ inch, two or three at a node: pedicels slender, $\frac{1}{16}$ to $\frac{1}{8}$ inch, pendulous: perianth segments with green central streak and white border: anthers longish not globose. Female flowers solitary: pedicel $\frac{1}{8}$ inch, stouter, three-angled. Petals larger than sepals in both male and female flowers. Capsule $\frac{1}{8}$ inch, globose. Seeds with rather distant longitudinal very slender ridges and minute cross-lines.

Nilgiri and Pulney plateaus, and generally the Western Ghats. *Bourne* 506, 596.*

Phyllanthus simplex Ret, var *gardneriana*; *F.B.I.* v 295, X 26. Branches long and slender. Leaves 1 to $1\frac{1}{2}$ by $\frac{1}{3}$ to $\frac{1}{2}$ inch, elliptic oblong, subsessile, with slightly cordate base, and revolute margin. Pedicels of male flowers $\frac{1}{8}$ inch: of female $\frac{1}{2}$ to 1 inch. Ovary smooth. 'Fruit smooth or spiny; seeds minutely tubercled.'

Pulneys: Glen falls near Kodaikanal. *Fyson* 2108, 3092, 3093. *Bourne* 1172, 1404. Nilgiris: at 7,000 feet (*Clarke*).

Gen. Dist. Also Ceylon.

The type species has narrow elliptic or oblong leaves $\frac{1}{2}$ by $\frac{1}{8}$ inch. *Fyson* 1906.

Gen. Dist. Of the species throughout India on the plains and low hills.

GLOCHIDION.

F.B.I. 135 XI.

Shrubs and trees with alternate quite entire leaves and axillary clusters of small unisexual flowers, the sexes on the same or different plants, with perianth of four to six lobes or sepals. Stamens of the male flower combined into a central column with erect anthers. Ovary in the female flower of three or more cells, each with two ovules with ventral raphe: styles short variously

combined. Neither sex with disc glands (distinction from *PHYLLANTHUS*).

Species 120 in tropical Asia, Malay archipelago and Pacific islands.

***Glochidion neilgherrense* Wight ; F.B.I. v 316, XI 27.**
A small tree with flattish-rounded outline, thick trunk and angular glabrous but lenticelled branchlets. Leaves $2\frac{1}{2}$ to 5 inches elliptic or ovate-lanceolate or oblong, acute or obtusely acuminate, with acute base and $\frac{1}{8}$ to $\frac{1}{4}$ inch stalk: nerves six to eight on each side of the pinkish midrib. Male and female flowers in the same cluster. Male flowers $\frac{1}{6}$ to $\frac{1}{4}$ inch, on stout pedicels of the same length, broadly funnel-shaped: sepals oblong, yellow: anthers three, surmounted by extensions of the connective half as long. Female flowers subsessile: sepals triangular, pinkish, pubescent: styles combined into a single long style. Fruiting branches usually bereft of leaves, so that the fruits are mainly on short lateral leafless twigs. Capsule $\frac{1}{3}$ to $\frac{3}{4}$ inch by $\frac{2}{3}$ inch deep, pubescent: surmounted by the now very stout style showing six stigmatic points. Seeds orange or red.

Nilgiris: by road-sides and in sholas, on the downs frequent; flowering in May, usually with great abundance and emitting a strong smell of honey from the male flowers, but female flowers not scented. The leafless fruiting branches are very characteristic. Pulneys: (?) at lower levels. *Fyson* 17c8, 2632. *Bourne* prob. 395, 1170.

***Glochidion velutinum* Wight ; F.B.I. v 322 XI 44.** A small untidy tree with crooked stem and branches. Young parts, leaves and flowers all densely tomentose or pubescent: twigs round, light coloured. Leaves shortly stalked, oblong or elliptic, obtuse, $1\frac{1}{2}$ by $\frac{3}{4}$ to $2\frac{1}{2}$ by 1 inch, withering red. Male and female flowers clustered together. Pedicel of male $\frac{1}{3}$ to $\frac{1}{2}$ inch, slender: sepals hairy. Pedicel of female stout, very short at first but

lengthening with the developing fruit and at length $\frac{1}{3}$ inch : sepals oblong $\frac{1}{12}$ inch : style stout slightly longer, cylindrical, truncate. Capsule depressed-globose, of five to six rounded bilobed segments each with two red seeds. Wight Ic. t. 1907/2.

Nilgiris : near Ootacamund and Lovedale. Pulneys : at lower levels, e.g., Shembaganur 5,500 feet. *Fyson* 418, 1103. *Bourne* 132.

Gen. Dist. The species was founded by Wight on a Nilgiri specimen. If the other sheets at Kew are correctly placed (in 1914), the species ranges from Nepal, Sikkim and Khasi hills to Canara and Mysore. But in some of these the leaves are larger, thinner and less hairy.

DAPHNIPHYLLUM. F.B.I. 135 XXII.

Trees with alternate entire leathery feather-veined leaves and lax axillary racemes of flowers with three to eight sepals but no petals : the male with large almost sessile anthers ; the female with a two-celled ovary with two ovules in each cell, pendulous with ventral raphe, and ripening to an olive-like drupe with one seed, containing much endosperm. Embryo small with narrow cotyledons.

Species 10 in tropical Asia, and Malay archipelago, tropical Africa.

Daphniphyllum glaucescens *Blume* ; *F.B.I.* v 353, XXII 3. Tree with oblong rounded outline, and peculiarly erect leaves with recurved margins, their backs showing outwards. Branches striated and rough with numerous broadly heart-shaped leaf-scars and circular bud-scars. Leaf-stalks $\frac{1}{2}$ to 2 inches, pink : blades 2 to 5 by $\frac{3}{4}$ to 2 inches elliptic, obtuse, acute at the base, with recurved margins, quite glabrous, usually tufted at the ends of the branchlets, erect and showing to the outside the bluey-green undersurface with its very clear network of veins. Flowers in racemes in the axils of the upper leaves. Male pedicel $\frac{1}{6}$ inch : perianth small, green ;

anthers seven to ten, large and red, with small white point, almost sessile on the flat broad disc. Female flowers in longer racemes: pedicel $\frac{1}{4}$ inch lengthening to 1 inch in fruit: ovary green: styles two, $\frac{1}{10}$ inch long. Fruit ellipsoid, like an olive, $\frac{1}{2}$ to $\frac{5}{8}$ inch by $\frac{1}{4}$ inch, slightly oblique, with very rough skin, and surmounted by the two minute sessile stigmas. Seed one only, with small embryo at the upper end.

Very common in sholas and occasionally in the open. Nilgiris: round and in Ootacamund and down to Pykara, Lovedale, Coonoor. Pulneys: on the downs above Kodaikanal. Flower in winter months, fruit in summer. *Fyson* 1139,* 1724, 1914. 2021, 2022. *Bourne* 479.

Gen. Dist. Also Ceylon, Java, Corea.

URTICACEÆ.

Herbs, shrubs and trees with alternate leaves and small flowers, complete or by reduction unisexual or still further reduced. Perianth typically of four or five sepals, but no petals: stamens as many opposite to them: ovary superior one-celled with one ovule, but stigma often two-lobed and eccentric.

Genera 100. Species 2,000 chiefly in the tropics.

The family is divided into seven tribes and comprises plants of such different habit and arrangement of flowers as the Elm, Hop, Mulberry, Jak Fruit, Fig and Nettle. Some of these are considered by some systematists distinct families, and those represented in our areas are alone described here.

CELTIDEÆ. F.B.I. 135, tribe 2.

Trees with no milky sap. Leaves alternate, with three sometimes more, main nerves at the base. Flowers appearing before the leaves, solitary or in axillary cymes, unisexual or occasionally complete. Sepals four or five. Stamens as many erect in bud. Ovule pendulous with its micropyle pointing upwards. Fruit fleshy. Embryo curved.

- Genera 9 or 10. Allied to the Elm but differs in its fruits.
 Leaves glabrous, nearly as broad as long: flowers $\frac{1}{4}$ inch, few
 or solitary CELTIS.
 Leaves white underneath: flowers $\frac{1}{8}$ inch, crowded at the leaf-
 axils TREMA.

CELTIS.

F.B.I. 136 III.

Nettle-tree.

Trees and shrubs with deciduous or evergreen leaves, often oblique at the base and small male or bisexual flowers in axillary racemes or solitary (these latter usually fertile), with the characters of the tribe (*q.v.*). Stigmas two, hairy. Pistillode in male flower hairy. Fruit globose or ovoid.

Species about 60 in temperate and tropical regions of the New and Old Worlds. *Fr.* Micocoulter.

Celtis tetrandra Roxb.; *F.B.I.* v 482, III 2, including *C. australis* L., *F.B.I.*, III 1; *Wall. Cat.* 369 l. A large tree: branchlets sometimes drooping. Leaves and young parts glabrous or pubescent. Leaf-stalks $\frac{1}{3}$ inch; blades $2\frac{1}{2}$ to 3 by $1\frac{1}{4}$ to 2 inches, elliptic, shortly acuminate, obtuse, with three nerves at the base and usually one other strong pair from the midrib; the outer nerves again forked outwards, all rather straight: margin serrate. Flowers in short axillary racemes or tufts. Fruit spherical, size of a small pea on a slender stalk $\frac{3}{4}$ inch long.

Nilgiris: common in Ootacamund (a fine specimen by the Havelock road just below the Toda mund) and on the downs to Coonoor. *Fyson* 1765, 3094, 3095, 1910. *Bourne*. Coonoor

Gen. Dist. Eastern Himalayas, South India, Burma.

I can see no difference between this and *C. australis* L., which occurs from Nepal to the north-west Himalayas, and the Salt Range and westwards to Spain.

The venation of the leaf is very characteristic. The leaves droop very markedly at night as if withered: the young foliage flushes pink and yellow, at Ootacamund in October,

***Celtis cinnamomea* Lindl. ; F.B.I. v 482, III 3.** A tree, with smooth grey bark : branches round with brown bark and very many lenticels : leafy-shoots green, finely pubescent. Leaf-stalks $\frac{1}{3}$ inch, glabrous, blades up to 4 or 6 inches by 2 to 3 inches elliptic or oblong, acute at both ends, quite entire, glabrous, shiny, green on the upper side, with three strong nerves at the base, the lateral reaching the tip though there faint, crossed by numerous nearly straight veins $\frac{1}{8}$ inch or more apart. Flowers in small pubescent panicles on the leafy shoots below the young leaves : male and female flowers mixed. Bracts and bracteoles soon falling. Sepals $\frac{1}{16}$ inch, pubescent, pink-tipped. Stamens slightly longer ; filaments opening out widely and pressing open the sepals ; anthers nearly round. Ovary egg-shaped, $\frac{1}{8}$ inch, with two large stout pubescent styles, which diverge from each of two sides.

Nilgiris : on the downs about Pykara. *Fyson* 2459.

Gen. Dist. Sikkim, Burma, Western Ghats, Ceylon, Malaya.

The tree is deciduous, and the young leaves come out with the flowers just before the monsoon rains, at Pykara towards the end of June ; they are terracotta or brownish towards the tips, not the yellow and red of *C. tetrandra*.

TREMA.

F.B.I. 136 IV.

Charcoal-tree.

Shrubs or trees with alternate, serrate, three or five-nerved leaves and long deciduous stipules. Flowers in axillary cymes, with the characters of the tribe *CELTIDEÆ* (*q.v.*) and differing from *CELTIS* in the male sepals being folded and valvate in bud, and the cotyledons of the seed narrow.

Species about 20 in the warmer regions of the New and Old Worlds,

Trema orientalis *Blume* ; *F.B.I.* v 484, IV 3 ; Charcoal tree. A small or large tree. Leaves ovate acute lopsided, finely serrate almost all round to the rounded or cordate base : nerves joined by numerous cross-veins : upper surface scabrid : lower white with silvery pubescence or tomentum. Drupe $\frac{1}{6}$ inch.

Nilgiris : at Kotagiri and below. Not at Ootacamund. Pulneys : at lower levels only. *Fyson* 1760, 1657, 3095. *Bourne* 214.

Gen. Dist. Lower hills of India, south of Nepal, Western Ghats, Ceylon.

MOREÆ. *F.B.I.* 136, tribe 4.

Mulberry, etc.

Trees, shrubs or herbs with as a rule milky sap, and small unisexual flowers with the characteristics of the family (p. 366) but the stamens bent down inwards in bud, with reversed anthers, straightening suddenly and ejecting the pollen with a jerk as the flower opens.

PHYLLOCHLAMYS. *F.B.I.* 136 IX.

Spiny shrubs and trees with entire penninerved leaves and small unisexual, diœcious flowers : the male in short involucre clusters ; the female solitary, stalked. Sepals of male three or four, inflexed in bud, imbricate : of female, three or four, which in fruit are accrescent and leafy. Fruit small, shorter than the sepals with one seed.

Species 3 : 2 in India, 1 in Africa.

Phyllochlamys spinosa *Bureau* ; *F.B.I.* v 488, IX 1. A tree up to 40 feet, amongst the highest in the shola, branching at acute angles. Smallest branches armed with slender axillary spines 1 inch long : older shoots $\frac{3}{4}$ inch thick with thick spines 2 by $\frac{1}{4}$ inch at the

base. Leaves 2 to 4 by 1 to $1\frac{1}{2}$ inches, obovate-acute, wedge-shaped for more than half the length, quite entire, glabrous. Stalk $\frac{1}{6}$ inch; nerves numerous, slender. Wight Ic. t. 1962.

Nilgiris: in sholas on the downs, but not common near Ootacamund. Pulneys: Gundattu shola above Kodaikanal but not common. *Fyson* 1983, 2678. *Bourne* 676.

Gen. Dist. 'From the Salt range eastwards along the foot of the Himalayas and southwards to Travancore and Ceylon.' I have not seen the flower or fruit of this species.

URTICEÆ. F.B.I. 136, tribe 7.

Herbs, shrubs or trees with watery juice (not milky) and unisexual flowers as given for the family (p. 366), disposed in open cymes, or aggregated in small involucre: but characterised specially by the stamens being at first bent inwards with reversed anthers, then straightening with a jerk which ejects the pollen, and by the ovule being erect with its micropyle at the opposite end to the hilum.

LAPORTEA. F.B.I. 136 XXVII.

Perennial herbs, shrubs or trees with stinging hairs and alternate mostly broad, toothed, feather-nerved leaves, and free or connate deciduous stipules. Flowers in small cymose bunches, arranged on the branches of axillary or terminal panicles. Flowers with the characteristics of the tribe 7 URTICEÆ (q.v.). Sepals of female four; ovary and achene oblique, flattened.

Species about 25, in Asia, Australia, Africa and a few in North America.

Laportea terminalis Wight; *F.B.I.* v 549, XXVII 1; Nilgiri Nettle. Branches, leaf-stalks and leaves armed with stout stinging hairs. Leaf-stalks 4 to 6 inches;

blades 4 to 8 inches, by $3\frac{1}{2}$ to 5 inches, broadly-ovate, bluntly acuminate, toothed all round to the base. Male panicles axillary, female subterminal long peduncled. Achenes slightly tubercled, on a winged pedicel. t. 236. Wight Ic. t. 1972.

In waste places and by the sides of sholas. Nilgiris : Ootacamund, Kotagiri, Avalanche. Pulneys : Kodaikanal and on the downs. Flowering June. *Fyson* 1838. *Bourne* 465, 1815, 2912, 2992.

Gen. Dist. Sub-tropical Himalayas, South India, Ceylon.

PILEA.

F.B.I. 136 XXIX.

Bastard or Soft Nettle.

Annual or perennial herbs of the tribe 7 *URTICÆ* (p. 370), without stinging hairs. Leaves opposite, three-nerved. Flowers in heads or lax cymose panicles. Sepals of the male flower concave, fleshy, often with an appendage or horn, on the back. Sepals of the female three, unequal, the dorsal one longest and often hooded or swollen on the back, with scales (staminodes) opposite them.

Species about 16 in Asia, Africa, and tropical America. *Ger.* Kanonierblume.

Pilea wightii Wedd. ; *F.B.I.* v 554, XXIX 10. Stem about a foot, weak and rooting at the lower nodes, quite glabrous. Leaves $1\frac{1}{4}$ to $1\frac{1}{2}$ by 1 to $1\frac{1}{4}$ inches, ovate or rounded, coarsely toothed or serrate acute or acuminate, three-nerved : stipules short or absent. Flowers small, clustered along the loose branches of an open cymose panicle. Achenes smooth, $\frac{1}{20}$ inch. t. 237.

Nilgiris : in plantation near Forester's hut, Krurmund road ; Pykara. Pulneys : Gundattu shola above Kodaikanal. *Fyson* 2613. *Bourne* 1817, 2913, 5220.*

Gen. Dist. Temperate Himalayas, Sikkim, South Indian mountains, Ceylon, Java.

Pilea stipulosa Miquel; *F.B.I.* v 555, XXIX 11. Distinguished by its very large oblong stipules; a tall herb. Leaves long-stalked, 3 to 5 by $1\frac{1}{2}$ to 2 inches elliptic, shortly acuminate, serrate, three-nerved at the base: stipules 1 to $1\frac{1}{2}$ by $\frac{1}{4}$ to $\frac{1}{3}$ inch. Flowers crowded in shortly-stalked, close cymose panicles, which are fascicled, two or three in a leaf-axil. Achenes minute smooth.

Pulneys: Gundattu shola. *Bourne* 560, 1818, 2914.

Gen. Dist. Ceylon (where the species was founded)

Pilea trinervia Wight, *Herb. Prop.*!; *F.B.I.* v 557, XXIX 16. Stem robust, glabrous, succulent. Leaves 3 to 6 by $1\frac{1}{2}$ to 3 inches, oblong lanceolate to broadly-elliptic acuminate, serrate. Outer pair of basal nerves connected to the midrib by numerous straight or slightly curved veins, and branching also to each tooth. Panicles axillary $\frac{1}{2}$ to 2 inches, much branched. *Wight* *lc.* t. 1973.

In cool shady places, woods, etc., common. *Fyson* 1194, 3491, 1195, 1202, 2113, 3096. *Bourne* 1819, 1819,* 242.

Gen. Dist. South India and Ceylon.

ELATOSTEMA. *F.B.I.* 136 XXXII.

Annual or perennial herbs, of the tribe 7 *URTICÆ* (p. 370), with alternate, very unsymmetric, coarsely toothed leaves, and characterised further by the flowers being aggregated in dense axillary cushions (receptacles), which are at first enclosed in an involucre of bracts, and in fruit become flat. Bracteoles to each flower two: sepals of the male very thin: sepals of the female small and narrow.

Leaves in very unequal pairs *E. surculosum*.
 Leaf coarsely toothed from apex to base *E. sessile*.
 Leaf with long point, and a few shallow teeth. *E. lineolatum*.

Elatostema sessile Forst; *var cuspidata Wight*, *Herb. Prop.*!; *F.B.I.* v 563, XXXII 2. Stem slender, flexuous,

1 to 2 feet. Leaves 4 by 2 to 5 by $2\frac{1}{2}$ inches, coarsely serrate from apex to base roughened on the upper side by numerous cystoliths. Receptacle $\frac{1}{4}$ to $\frac{1}{3}$ inch; in fruit $\frac{1}{6}$ to $\frac{1}{4}$ inch, with numerous achenes imbedded in it: bracts with dorsal spurs; bracteoles minute. In woods, etc. t. 238. Wight Ic. t. 1983.

Nilgiris: Ootacamund to Neduwattum. Pulneys: above Kodaikanal and down to 5,000 feet. *Fyson* 1803, 2326. *Bourne* 1821.

Gen. Dist. Temperate and tropical Himalayas from Chamba eastwards, Assam, Sylhet, Khasia, Japan, Malay, Pacific islands and tropical Africa.

In t. 238: *a* underside of receptacle showing bracts with dorsal spur; *b* female receptacle from above; *c* male receptacle; *d* female flower with bracteole; *e* stalked female flowers mixed with the others [*E T.B.*]

I do not find the female receptacle without bracts as given in F.B.I.

***Elatostema lineolatum* Wight; F.B.I. v 565, XXXII**
6. Stem slender. Leaves narrow with long acumen and three or four shallow teeth in the further half only, the basal half being cuneate entire. Male receptacle $\frac{1}{6}$ to $\frac{1}{4}$ inch, embraced by a number of rounded bracts. Flower embraced at first by two very boat-shaped semicircular bracteoles. Wight Ic. tt. 1984, 2091 f. 1.

Nilgiris: at Neduwattum. Not collected near Ootacamund. Pulneys: in sholas below Kodaikanal and perhaps also near Kodaikanal. *Fyson* 3931, 3861. *Bourne* 291, 1178, 1814, 1822.

Gen. Dist. Tropical Himalayas, Khasia, South India, Ceylon.

***Elatostema surculosum* Wight; F.B.I. v 572, XXXII**
27. Leaves similar to those of *E. lineolatum*, but the apex not at all acuminate, and each with opposite it a very small leaf, which is often deflexed. Female receptacle small. Male receptacle sessile. Bracts larger, long-horned. Flowers when open exerted on $\frac{1}{8}$ -inch pedicels. Wight Ic. t. 2091 f. 4.

Pulneys: in sholas. *Fyson* 396. *Bourne* 406, 583.

Gen. Dist. Temperate Himalayas from Simla to Sikkim, Khasia, Naga hills, Nilgiris, Ceylon.

reddish, campanulate or hemispheric, $\frac{1}{12}$ inch; in bud flat-topped. Male sepals five, inflexed. Female flowers minute, ripening before the male flowers and therefore mostly to be found in the upper axils. Sepals five, scarious, tips not inflexed: style $\frac{1}{8}$ inch, hairy like a cat's tail. Fruit $\frac{1}{8}$ inch, nearly circular flat or flattened on one side with low wing in the middle: but inside dark green, pointed. Very variable in respect of hairiness. t. 239. Wight Ic. t. 1978.

Pulneys: in sholas on the downs. Flower September. Nilgiris. *Fyson* 1111, 1351, 2063, 2742, 3097. *Bourne* 226, 292, 505, 1828, 2921.

DROGUETIA.

F.B.I. 136 XLV.



Slender herbs with opposite or alternate three-nerved toothed leaves, without stinging hairs. Flowers of the type of tribe 7 *URTICEÆ* (p. 370) but much reduced and collected into scabrid calyx-like involucre: the male flowers with a small three-to five-lobed perianth and a single stamen inflexed in bud, and the female flower with no perianth but only an ovary and long straight stigma: usually arranged with a female flower in the middle of the involucre and four or more male flowers round it.

Species 4 in India and Africa.

Droguetia diffusa Wedd.; *F.B.I.* v 593, XLV 1. Stem slender diffuse hairy, with long internodes. Leaves stalked, $\frac{3}{4}$ to $1\frac{1}{2}$ by $\frac{1}{2}$ to 1 inch, ovate coarsely crenate-serrate, with a few scattered hairs on the upper side and on the nerves of the under. Involucres, one to four at a leaf-axil, salver-shaped, with short stalk and lobed bowl, silky: bract very silky. Flowers very small, one female and one to three males; the perianths of the latter closely attached together and coalescing into one rather fleshy mass. t. 240. Wight Ic. t. 1982.

In woods. Pulney downs and below. *Fyson* 568, 2102, 3098. *Bourne* 261, 1831, 2033.

The number and arrangement of the involucre varies considerably in the same plant and even in adjoining leaf-axils, as also does the number of flowers to the involucre of the same axil. I have found six to each of two opposite leaf-axils, making twelve at a node, two of these with three males and one female flower, four with one female flower only. An involucre of three or four male flowers may easily be mistaken for a normal flower with three or four stamens unless the flask shaped perianth to each stamen is noted.

In. t. 240: *a* a four-toothed involucre with bract, behind, and in it three male and one female flower; *b* plan ( male flower  female).

CUPULIFERÆ.

QUERCUS.

F.B.I. 140 III.

Oak.

Trees with alternate toothed or lobed leaves, and small unisexual flowers. Male flowers in erect on pendulous spikes, with four to seven perianth lobes and many stamens. Female flowers enclosed at first by imbricating bracts, which enlarge as the fruit grows and become a cup with the nut (*acorn*) seated in it.

Species about 300, mostly of north temperate regions and specially in North America.

Quercus ilex *Linn.*; *F.B.I.* v 602, III 4; the Holm-, Holly-, or Evergreen Oak. Leaves nearly entire, thick, leathery.

Planted at Kodaikanal. *Fyson* 1822. *Bourne* 500.

SALICACEÆ.

A family of two genera SALIX Willow and POPULUS Poplar, Aspen. .

SALIX.

F.B.I. 141 I.

Deciduous trees with alternate three-to five-nerved stipulate leaves and calkins of small flowers. Each flower in the axil of a bract, without sepals or petals,

but with glands or a disc, two stamens and a one-celled ovary containing few or many ovules on two or four placentas. Fruit an egg-shaped capsule with few or many seeds with long silky tuft of hairs. Embryo with plano-convex cotyledons and short radical pointing downwards endosperm.

Species 200 chiefly in north temperate zone.

Salix tetrasperma *Roxb.*; *F.B.I.* v 626, 11. A large well-branched tree with slender twigs. Leaves 2 to 3 by $1\frac{1}{2}$ to 2 inches, ovate-acute, serrate, glabrous but bluish underneath, glossy above: stalk $\frac{1}{4}$ inch. Male calkins 2 to 4 inches in leafy branches, bracts broad ovate, hairy. Female calkins 3 to 5 inches, with smaller bracts. Capsule $\frac{1}{8}$ to $\frac{1}{6}$ inch, very variable: seeds four to six.

Nilgiris: Ootacamund to Pykara. Pulneys: Poombari valley, not near Kodaikanal. *Fyson* 2476. *Bourne* 1268.

Gen. Dist. Mountains of tropical and sub-tropical India from Punjab to Travancore and Singapore, not Ceylon.

BURMANNIACEÆ.

Annual, or by a rhizome perennial, erect usually unbranched herbs, with leaves mostly at the base or reduced to mere scales. Flowers solitary or in terminal pyramidal panicles; with inferior ovary; three greenish sepals; three petals, smaller or even obsolete; and three to six stamens inserted and enclosed in the perianth tube, with short, even very short, filaments and normal anthers on a variously dilated connective. Ovary with three placentas, parietal or axile. Seeds numerous, minute.

A small family of about 50 species in the tropics of the Old World, China, and North America.

BURMANNIA.

F.B.I. 147 I.

Small annual herbs with radical sword-shaped leaves, or mere scales, and few or solitary flowers with the characters of the family. Perianth tube straight, at its base where it surrounds the ovary three-winged, above this the inner lobes (petals) smaller than the outer. Anthers three, sessile on the perianth, the two lobes separated by a broad connective and opening transversely. Ovary three-celled. Fruit a three-celled capsule with many seeds.

Species about 20, in all tropical countries from North America to China. Some grow in dry sandy places, others only in water. These latter have slender yellowish or brownish stems and small scales instead of leaves, obtaining their organic nourishment, as saprophytes, from the water.

Burmattia candida Griffith; *F.B.I.* v. 665, I 5. Stem slender, colourless, 4 to 8 inches high. Leaves reduced to scales $\frac{1}{8}$ to $\frac{1}{5}$ inch long. Flowers white, solitary or in twos. Ovary with its wings $\frac{1}{4}$ to $\frac{1}{2}$ inch long, round or obcordate in outline; wings $\frac{1}{8}$ inch wide spirally twisted. Perianth very small, outer lobes $\frac{1}{16}$ inch, inner half as long and wide. t. 241.

In damp spots, often with *Utricularia*. Pulneys: below Kodaikanal on Church cliff; flowering June. Not common. *Fyson* 3099. *Bourne* 15.

Gen. Dist South India, Burma, Khasia, Bengal.

ORCHIDACEÆ.

The Orchid-flower differs profoundly from all others, for there are no separate stamens and style, but only one central column, on the top or at the side of which lies a solitary anther, and on its front face a stigma.

[In the small group of Slipper-orchids, *CYPRIPEDIUM*, which do not grow here, the structure is a little different, there being two anthers, one on either side of the column.]

The ovary is inferior and long, taking the place of the pedicel which is as a rule absent. There are three sepals and three petals, as is usual with monocotyledons, but one of the petals is very different in shape from the others, and generally has a bag-like depression at the upper end, called a 'sac' if it is shallow (t. 258), or a 'spur' if it is long (tt. 254, 256).

This petal, known always as the lip or the labellum, is really the uppermost or dorsal one and in a few orchids, e.g., *SATYRIUM* (p. 405) stands up at the back of the flower, but in most cases is brought by a twisting of the ovary to the lower side and hangs down there. It is not usually difficult to make this out by the twisting of the lines in the ovary (t. 251).

For the explanation of the structure of the column reference must be made to Darwin's *British and Foreign Orchids* or to any good text-book; it must suffice here to say that, assuming the flower to be derived from the usual monocotyledonous type of five whorls of three each, i.e., three sepals, three petals, three outer stamens, three inner stamens and a three-celled ovary, the column is considered to be made up of one stamen of the outer whorl and two styles whose stigmas, fused into one, form the sticky hollow on its face. The other five stamens are all aborted, unless perhaps two of them are part of the column, e.g., when that is winged, and two more part of the labellum when it has lateral lobes. The pollen of each half anther is always aggregated into one, two or four waxy masses termed polliniums.

The disposition of the two halves of the anther differs in different orchids. In *HABENARIA* and its allies—such as the large white Elephant's Head or Snowdrop orchid, the Purple-ground orchid, the Sweet-Scented Pink Twin-spur, and the Butterfly, Pyramid and Marsh orchids of England,—the two halves, though close together at the top are separated at their bases and attached to either side of the column. They open separately by longitudinal slits to let out the polliniums. But in most orchids, as *ÆRIDES* the Pink Rock orchid, and *CŒLOGYNE* the Banana orchid, the two halves of the anther lie together on top of the column and open by a cap which comes off as a whole exposing the polliniums. In some of these orchids, e.g., *ÆRIDES*, the anther-cap simply falls off at the slightest touch, in others, e.g., *CŒLOGYNE*, it remains attached by a filament (tt. 243, 247). The polliniums have slender stalks (*caudicles*) ending in a swelling or an elastic band which is or becomes attached to an easily removed piece of the top edge of the column, called the *rostellum* (t. 252).

The two stigmas are usually combined as a slightly hollowed sticky surface on the front of the column below the anther: in *Habenaria longicalcarata* (t. 253) they project on either side as curved green processes.

All these structures are very cleverly and wonderfully adapted for causing the transference of pollen from one flower to another by insects which are attracted as a rule by honey secreted in the sac or spur of the lip. The mechanism varies very considerably and orchids are so highly specialised in this respect that often pollination fails and no seeds are set simply because the proper insect for that species has not visited the plant. In general the head or proboscis of a bee, probing the spur for honey, touches the rostellum which adheres to it, so that when the insect flies away the anthers open, and the polliniums are dragged out and carried off. A bending of the stalk of the pollinium as it dries during the insect's flight may, if necessary, bring the pollen-mass into such a position that in another flower it touches the stigma. The elasticity of the connecting band or of the thread which binds the groups of pollen together allows of some being left on the stigma while the rest may be carried to another flower.

The fruit is a capsule containing an enormous number of very small seeds which are easily carried by the wind, and this perhaps explains why so many orchids grow high above the ground on the branches of trees.

The vegetative parts vary also considerably. There is always a perennial root-stock; but this may consist of tubers or of a creeping rhizome. In some the shoot grows on year after year bearing flowers laterally (a monopodium, t. 249), in others it finishes each season's growth with an inflorescence (sympodium, t. 243).

Throughout the family there is a remarkable diversity in the form of the flower which may even imitate the appearance of some insect (e.g., the Bee and Fly orchids of England). The size, brilliancy and lasting qualities of many species have made them favourites with horticulturists who are constantly producing hybrids.

The family is one of the largest among flowering plants, having over 400 genera and 5,000 species. Of these 1,600 have been found in India, most of them peculiar to the country. The south-east Himalayas, Assam and North Burma is the richest area: the Deccan is comparatively very poor.

a	{	Pollen sacs together on the top of the column . . .	b
		Pollen sacs on either side of column. Ground orchids .	h
b	{	Ground orchids	c
		Tree orchids	f

- c { Flowers $\frac{3}{4}$ inch or more in tall racemes d
 { Flowers $\frac{1}{4}$ inch e
 d { Flowers mauve or white, with long spur. *p.* 391. CALANTHE.
 { Flowers yellowish, $\frac{3}{4}$ to 1 inch, often without leaves: lip
 saccate *p.* 392. EULOPHIA.
 Flowers many, yellowish, in a close spiral: leaves few, small.
 p. 397. SPIRANTHES.
 e { Flowers many, racemed coloured: leaves broad-folded
 along the nerves *p.* 384. MICROSTYLIS.
 Flowers few, white; lip bifid and fringed: leaves roundish
 flat *p.* 398. CHEIROSTYLIS.
 f { No obvious rhizome or tuber g
 Tubers or pseudobulbs h
 Orchids of rocks or trees: stem stout: leaves hard:
 flowers pink *p.* 394. ÆRDES.
 Stem slender: leaves cylindrical, quill-like: flowers small
 g { with $\frac{1}{2}$ inch sac, in drooping racemes, yellowish or
 pink *p.* 396. SACCOLABIUM.
 Leaves sword-like: flowers many, small, whorled or
 scattered along erect spikes *p.* 382. OBERONIA.
 Tubers flat and round *p.* 386. ERIA.
 h { Tubers banana-like, close together: flowers $\frac{3}{4}$ to 1 $\frac{1}{2}$
 inches *p.* 388. CÆLOGYNE.
 Leaves solitary, jointed to the erect tubers at intervals
 along a creeping stem *p.* 385. CIRRHOPETALUM.
 Flowers pink with two spurs *p.* 406. SATYRIUM.
 i { Flowers $\frac{1}{4}$ inch, sepals and petals forming a flattish hood,
 column with two lateral spinal processes, lip with two
 narrow spreading lobes, no spur. *p.* 407. DISPERIS.
 Flowers white or purplish; always with spur or sac . . .
 p. 398. HABENARIA, ETC.

OBERONIA.

F.B.I. 148 I.

Epiphytes growing on the branches of trees to which they attach themselves by roots. Leaves in two ranks, closely fitting at the base, sword-like (i.e., compressed sideways as in Iris) thick, equally green on both sides. Inflorescence terminal. Flowers very small, in dense cylindrical spikes 3 to 4 inches by $\frac{1}{4}$ inch, terminating the main axis.

Sepals broadly ovate. Petals smaller. Lip four or two-lobed, concave embracing the short column to which

there is no foot. Anther caps without retaining filament. Polliniums four, waxy, without attachment.

Species about 50 in tropical Asia and Africa and islands of the Pacific and Indian Oceans. Not as a rule cultivated.

Oberonia verticillata Wight, *Herb. Wight Prop.* 179!; *F.B.I.* v 677, I 9. Leaves 2 to 4 inches by $\frac{1}{3}$ to $\frac{1}{2}$ inch, smaller than the other species. Spikes up to 10 inches; flowers in whorls $\frac{1}{4}$ inch apart. Lip broadly obcordate. Capsule $\frac{3}{10}$ inch. Wight lc. t. 1626.

Nilgiris: on the lower edge of the plateau—Avalanche, not near Ootacamund. Pulneys: Levinge stream and below Glen falls near Kodaikanal, but not on the downs. *Fyson* 2502. *Bourne* 682, 1036.

Oberonia brunoniana Wight, *Herb. Wight Prop.*!; *F.B.I.* v 681, I 24. Leaves 10 to 14 inches by $\frac{1}{2}$ to 1 inch. Spikes as long, their stalks clasped in the bottom quarter by a leaf; above, for 1 to 3 inches, flattened and broadened like a leaf. Lip roundish, with a single or double small terminal lobe; the main part with crenulate margin. Capsule $\frac{1}{4}$ inch. Wight lc. t. 1622.

Nilgiris: near Ootacamund and down to Pykara and Neduwattum. Pulneys: below Kodaikanal on Church Cliff. *Bourne* 1837, 2931, etc.

Oberonia wightiana Lindl.; *F.B.I.* v 683, I 32; common Nilgiri Oberonia. Leaves 2 to 6 by $\frac{1}{2}$ inch. Spikes up to 14 inches with flowers to within 1 inch of the base. Lip with rounded lateral-basal lobes and a terminal pair of smaller ones, diverging and curved, with their inward margins toothed. Capsule $\frac{1}{8}$ inch. Wight lc. t. 1628.

Nilgiris: common in woods on the plateau. Pulneys: in sholas beyond the Observatory, Poombari, etc. *Fyson* 1850. *Bourne* 531, 1838, 2932, 2438,* 4657.

Gen. Dist. Also Ceylon.

MICROSTYLIS.

F.B.I. II.

Ground orchids with broad corrugated leaves in two ranks and fitting over each other at the base, and terminal spikes of brownish or purplish flowers. Lip erect concave, embracing the column at the base: upper sepals oblong recurved: lower one and the other two petals narrow. Column very short, flanked on each side by a wing: anthers erect, polliniums four.

Species about 50 to 70, in the northern half of the tropics.

Microstylis rheedii Wight; *F.B.I.* v 690, II 18. Stem stout, 3 to 6 inches, bulbous at the base. Leaves 3 to 5 by $1\frac{1}{4}$ to $2\frac{1}{2}$ inches, five to seven-nerved at the base, acute or acuminate: leaf-stalks sheathing at the base. Raceme $2\frac{1}{2}$ to 3 inches, raised by as much above the last leaf. Flowers fragrant, variable in colour and size, sepals narrow $\frac{1}{5}$ to $\frac{1}{3}$ inch by $\frac{1}{20}$ inch. Petals $\frac{1}{4}$ to $\frac{1}{40}$ inch. Lower lip rounded, broadly triangular or kidney-shaped, slightly lobed or pectinate. Stylar column $\frac{1}{8}$ inch. Capsules $\frac{1}{2}$ to $\frac{1}{4}$ inch. Wight Ic. t. 902.

Pulneys Bearshola near Kodaikanal, but not common at these levels. Much more so below. *Fyson* 83. *Bourne* 371, 2933, 2934.

Gen. Dist Western ghats, Deccan, Shevaroyas, etc

Microstylis versicolor Wight, *Herb. Wight Prop.* 1781; *F.B.I.* v 691, II 19. Green leaves usually two only; but smaller scarious ones sheathe the lower part of the stem and the small falsebulb. Green leaves 2 to 3 by $\frac{3}{4}$ to $1\frac{1}{4}$ inches, ovate acute, wrapped round the flowering axis and each other at the base, and folded along the five or more nerves. Flowering axis 2 to 8 inches naked, bare below, above with $\frac{1}{4}$ inch lanceolate, deflexed bracts. Flower-stalks $\frac{3}{16}$ to $\frac{1}{4}$ inch, very slender, spur as long, slender. Lip circular or kidney-shaped, deeply

toothed. Lateral sepals ovate. Petals narrow. t. 242. Wight Ic. t. 901.

In woods. Nilgiris : Kotagiri and above to Ootacamund. Pulneys : on the downs. *Fyson* 567. *Bourne* 590, 1062, * 4614.

Gen. Dist. South Indian hills and Ceylon.

Very variable in the colour and size of the flowers, and in the size and relative breadth of the leaves. One specimen from Kodaikanal (*Sauliere* No. 16 'at 8,100 feet') is in leaf exactly like *M. lacifolia Thwaites* a Ceylon species, but differs in the bracts being deflexed, instead of suberect as in that species. I have seen other specimens so different as to appear distinct species but which are, I think, only varieties of *M. versicolor*.

* *var luteola*. Plant smaller, spike shorter, 2 inches, but flowers larger and less crowded, green with slight pinkish tinge. Lip broader than long with eight pairs of teeth and a median shorter one on both plateaus. *Bourne* 1035, 2935. Wight Ic. t. 1682.

CIRRHOPETALUM. F.B.I. 148 XI.

Tree orchids with long cylindrical creeping stem, often clothed with small scales or their fibrous remains, and each section of an inch or so ending in an upright tuber or *pseudobulb* bearing at the top a single, thick, oblong-oval leaf jointed to it and folded in bud, and on one side a slender axis with two or three bracts and a terminal whorl of flowers, peculiar in the two side sepals being three or four times as long ($\frac{1}{2}$ inch) as the petals ($\frac{1}{6}$ inch) and projecting in front like a double lip.

Species 40, chiefly in India and Malaya.

Cirrhopetalum thomsoni *J. D. Hooker* ; *F.B.I.* v 778, XI 27. Stem $\frac{1}{8}$ inch thick; tubers $\frac{1}{2}$ to 2 inches apart, $\frac{1}{2}$ to $\frac{3}{4}$ inch high, conical, green. Leaf elliptic or linear-oblong, obtuse, 2 inches by $\frac{1}{2}$ inch with a fair midrib and numerous parallel slender nerves, thick and leathery, and falling off by a clean joint from the top of the bulb. Flowering axis very slender, with two to three small scale-sheaths at the base, and thin, ovate bracts $\frac{1}{6}$ inch. Flowers umbelled, four to five standing horizontal. Side sepals $\frac{1}{2}$ inch by $\frac{1}{8}$ inch, lanceolate, curved, five-nerved, yellowish-green with small reddish purple spots near the

somewhat broader base, quite free of one another: dorsal sepal $\frac{1}{6}$ inch, marked with five reddish streaks and a network. Side petals $\frac{1}{8}$ inch, three-nerved. Lip jointed to the projecting foot of the column, itself short, curved backwards and upwards. Pollen masses, four, more or less connected in pairs.

Pulneys: in sholas near Kodaikanal. *Bourne* 584, 1194, 1840, 2938. Nilgiris: Neduwattum. *Wight, Thomson, Clarke*.

ERIA.

F.B.I. 148 XIX.

Small tree orchids remarkable for the round rather flat bulb-like tubers, or pseudobulbs $\frac{1}{4}$ inch across, jointed together in rows, from the youngest of which rise a pair of lanceolate leaves, set exactly opposite each other and jointed to their bases, and a very slender flower-axis with two to five white star-like flowers.

Species: about 80 in tropical Asia.

Flower 1 inch across, solitary: tubers enclosed in a network . . .
E. braccata.

Flowers $\frac{3}{4}$ inch, two to five on the stalk: tubes naked . . .
E. nana.

Eria braccata Lindley (*E. reticosa* Wight); *F.B.I.* v 787, XIX 6. A small tree orchid distinguished by very distinct netting over the flat round tubers, and the single large white flower, over an inch across on the slender stalk.

Tubers $\frac{1}{3}$ to $\frac{1}{2}$ inch, less than $\frac{1}{6}$ inch thick, joined in rows and each enclosed in a very thin covering with a raised network of veins, which meet in the centre, a solid boss $\frac{1}{10}$ inch across with a raised scar in the middle. Leaves from an as yet unformed tuber, at the end of the row; basal sheathing scales two or three, imbricating like the leaves in two ranks, with crinkled and curled back margins. Leaves $1\frac{1}{4}$ to $1\frac{3}{4}$ inches by $\frac{1}{4}$ to

$\frac{1}{3}$ inch, elliptic acute, sheathing at the base, with strong midrib and two pairs of very obscure lateral veins, fairly thick and firm. Flowering-axis not as long as the leaves, firm: bract broadly ovate, acuminate, five-nerved, clasping at the base the ovary. Sepals and petals spreading, starlike, $\frac{3}{4}$ inch: dorsal sepal $\frac{1}{4}$ inch, obscurely five-nerved; lateral, $\frac{3}{8}$ inch at the widest in shape like a crescent with one arm (that attached to the long foot of the column) cut off short. Petals $\frac{1}{6}$ inch wide, narrowed at the base. Lip erect rising from between the incurved ends of the sepals from a base $\frac{1}{8}$ inch wide, curved forwards; its middle or terminal lobe $\frac{1}{5}$ inch wide with finely crenulate margin and white triangular tip, the rest orange yellow, with two central crested ridges which run back to the base of the column; side lobes erect $\frac{1}{8}$ inch high, their upper edges purple. Column $\frac{1}{10}$ inch wide, in the lower $\frac{1}{2}$ inch yellow edged with purple, broadened below the anther to $\frac{1}{6}$ inch for the stigma. Anther projecting over the stigma, attached at the back by a filament, with two oval pollen sacs in the hinder and lower half. Polliniums four, attached altogether, with a little powdery pollen in addition at the base. Ovary $\frac{1}{8}$ to $\frac{1}{6}$ inch, with six prominent crenulate ridges. Pod $\frac{1}{2}$ inch. t. 243. Wight Ic. t. 1637 (*E. reticosa*).

Nilgiris: on trees near Pykara, common. Odour distinct though faint. The flower is as large as *Cœlogyne odoratissima* and very like it in general appearance. *Fyson* 2722. *Bourne* 5123.

Gen. Dist. Western Ghats and Ceylon. Not collected on the Pulneys.

Eria nana A. Rich.; *F.B.I.* v 789, XIX 14. Tubers $\frac{1}{4}$ to $\frac{1}{2}$ inch, clustered, round and depressed in the centre, when dry marked with numerous raised reticulating veins. Leaves oblanceolate or obovate, 1 to 2 by $\frac{1}{3}$ to $\frac{1}{4}$ inch, thin, soon falling off the short base,

with a dozen or so slender parallel nerves joined by veins. Flowers in the axils of persistent bracts $\frac{1}{6}$ inch long: pedicel $\frac{1}{8}$ inch. Sepals and petals nearly equal, $\frac{5}{8}$ inch by $\frac{1}{10}$ inch, acute; the lateral sepals attached to the foot of the column and forming with it a distinct sac. Lip larger, attached to the foot of the column. Column short. Polliniums eight, pear-shaped, attached together in pairs to sticky discs. Pod $\frac{1}{8}$ inch by $\frac{1}{16}$ inch, capped by the dried perianth. t. 244. Wight Ic. t. 1642 lower right hand figure (*Dendrobium filiforme*).

On trees, especially horizontal branches, often among moss. Quite common on the Kodaikanal and Ootacamund downs. Not known apparently except on these hills. *Fyson* 1134. *Bourne* 681, 1842, 2940.

In t. 244: *a.* flower with a lateral sepal and a lateral petal torn off to show the lips sessile on the foot of the column and incumbent, with edges crenulate. [*E.T.B.*]

CŒLOGYNE.

F.B.I. XXXIV.

Epiphytic plants, growing on trees, with short creeping rhizome made up of annually renewed, tuberous, erect sections, clothed at first by scale leaves but later on swollen and bare, and bearing at the top one or two of the few foliage leaves. Young sections ending in a slender flowering axis (scape) bearing a few large flowers. Leaves evergreen, but with a joint at the base of the blade, so that the blade separates very easily from the top of the tuber or leaf-sheath. Sepals and petals nearly equal, spreading out reflexed: lip with two side-lobes erect and clasping the column, and a middle lobe with raised corrugations, not spurred or saccate. Column slightly curved, winged towards the top, and often with two staminodal auricles. Anthers pendulous with distinct stalk, incumbent on the three-lobed

rostellum, covered by a hood: Polliniums four, cohering in pairs by short granular caudicles.

The annual tuberous sections, each ending ultimately in a flower, are sufficient to distinguish *Cœlogyne* from all our other orchids except *Spiranthes* and *Cheirostylis*, which are ground plants. Though formed every year, the sections and their leaves are perennial, and remain green for many years.

Species 50 to 70. All in India and the Malay Islands. This genus has furnished some of our most beautiful cultivated orchids.

a	{	Lip with four parallel ridges : tubers 4 inches	
			<i>C. glandulosa.</i>
	{	Lip with two ridges only	<i>C. mossiæ.</i>
b	{	Lip with three ridges : tubers 1 inch	b
		Leaves 2 to 4 by $\frac{1}{2}$ inch	<i>C. odoratissima.</i>
	{	Leaves 4 by $1\frac{1}{4}$ inches	<i>C. nervosa.</i>

Cœlogyne odoratissima Lindley; *F.B.I.* v 834, XXXIV 25; the sweet-scented Plantain Orchid. Tubers variable, from $\frac{1}{2}$ to 1 inch by $\frac{1}{2}$ inch, slightly wrinkled, clothed only at the base by the brown remains of the scales. Leaves 2 by $\frac{1}{2}$ inch, less or more, thin, acute at both ends, with light midrib and two dark green nerves as well as other slenderer ones. Spike two to three-flowered, longer than the leaves, slender. Bracts $\frac{3}{4}$ inch, light brown and scarious: pedicel $\frac{1}{4}$ inch: ovary shorter. Sepals 1 by $\frac{1}{4}$ inch, keeled. Petals as long, but narrower. Terminal lobe of lip $\frac{1}{2}$ by $\frac{3}{8}$ inch, curled down at the tip and the sides: lateral lobes $\frac{1}{8}$ inch high, projecting forwards $\frac{1}{5}$ inch beyond their attachment to the rest; space between with three raised crenulate ridges, the lateral of which run on to the terminal lobe and are there coloured like its middle patch, yellow. Column very slender in general shape oblanceolate, $\frac{1}{2}$ inch high, $\frac{1}{20}$ inch wide at the base, $\frac{1}{8}$ inch near the top, the winged margin forming a hood round and over the anther. Anther sac showing as an oval yellow body; polliniums four, in two pairs.

On trees, growing commonly in dense masses, distinguished from the other species by the thin and smaller leaves and the few flowers. t. 245. Wight Ic. t. 1640.

Nilgiris: downs near Ootacamund, in sholas common, Dodabetta. Flowers from May to July. Not collected at Kodaikanal. *Fyson. Bourne* 4779, etc.

Gen. Dist. Also Ceylon.

Cœlogyne nervosa *A. Rich.*; *F.B.I.* as *C. corrugata* *Wight*, v 835, XXXIV 26; the lesser Plantain Orchid. Tubers ovoid, deeply wrinkled or corrugated, 1 by $\frac{3}{4}$ inch; the oldest with the remains of the old flowering stem; younger with two leaves and a fruiting stem; youngest, still unformed, $\frac{1}{4}$ inch thick, covered with imbricating scales, the uppermost and innermost of which become the two green leaves, and having a flowering spike. Leaves elliptic, 4 by $1\frac{1}{4}$ inches, hard. Spike 4 inches, bracts 1 by $\frac{1}{6}$ inch, conspicuous spreading, scarious and light brown while the flower is open, and persistent till the pod forms. Sepals and petals 1 inch, white, elliptic. Mid-lobe of lip rounded, $\frac{1}{4}$ by $\frac{1}{4}$ inch: side-lobes $\frac{1}{6}$ inch high. Column $\frac{1}{2}$ inch, slender, curving forwards at the top, prominently winged and also projecting $\frac{1}{16}$ inch well above the anther. Anther hinged to the flap. Polliniums four, joined at the base. Pod $1\frac{1}{4}$ by $\frac{1}{2}$ inch, deeply five-angled. t. 246. Wight Ic. t. 1639. (*C. corrugata*, not t. 1638.)

Pulneys: in sholas round Kodaikanal. Nilgiris: Coonoor. *Fyson. Bourne* 1224.

Richard's *nervosa* is an earlier name than Wight's *corrugata*. The species therefore stands as *C. nervosa* *A. Rich.*

Cœlogyne glandulosa *Lindley*; *F.B.I.* v 835, XXXIV 27; the Plantain Orchid. Tubers 2 to 4 by 1 inch, contracted at each end, curved. Leaves 4 to 12 by $1\frac{1}{4}$ inches. Stalk of racemes sheathed almost to the flowers

by enveloping bracts; later lengthening, and the bracts deciduous. Floral bracts $1\frac{1}{4}$ by $\frac{1}{3}$ to $\frac{1}{2}$ inch. Flower-stalks 1 inch. Sepals and petals $1\frac{1}{4}$ by $\frac{1}{2}$ inch, pure white. Centre of lip with a pair of high ridges and a pair of lateral shorter ones, all smooth. Wight Ic. t. 1638.

On rocks. Pulneys: near Kodaikanal, Pamban stream, etc. *Bourne* 1223, 1332, 2940,* 2941.

Cœlogyne mossiæ Rolfe; XXXIV 27.* Tubers ovoid wrinkled. Leaves about nine-nerved. Spikes five or six-flowered. Lip with two raised ridges only. t. 247.

Nilgiris: on the downs. Rare.

Apparently very rare. Mr. Rolfe, at Kew, had seen only one specimen. The figure (t. 247) appeared to be his species, but I had not my specimen, from which the figure had been drawn, to compare with the type plant.

CALANTHE. F.B.I. 148 XXXVII.

Large ground orchids with broad longitudinally plaited leaves, wrapping round each other in bud, but not in two ranks. Flowering shoot lateral on the stem (not terminal). Sepals and petals approximately equal. Lip adnate to the short column. Polliniums eight, slender.

Species about 40, mostly in tropical Asia, but also in Japan, islands of the Pacific and Indian Oceans, tropical Africa, Central America, Mexico and the West Indies.

Calanthe veratrifolia Brown; F.B.I. v 851, XXXVII 15; the white Wood Orchid.

A large plant, with the habit of a Eucharis Lily but the leaves folded between the main veins like a fan, and tall racemes of white flowers, with lip bifid and spreading out flat, and long slender spur.

Stem tuberous, growing in the ground with long thick roots. Leaves spirally placed, plaited (like a fan): stalk 6 inches, blade 10 inches by 4 inches, larger or

smaller, dark green. Flowering axis about 2 feet. Flowers rather crowded towards the top: bracts $1\frac{1}{4}$ inches, lanceolate, acute, herbaceous; upper smaller $\frac{1}{2}$ inch: flower-stalk (ovary and pedicel) 2 inches. Sepals $\frac{1}{2}$ inch, elliptic, obovate, five-nerved; petals equal, three or five-nerved: all five erect or spreading. Lip hanging prominently outwards, with four oblong lobes, two on each side, spreading outwards and attached to the foot of the column and forming with it a short canal leading to the hollow of the spur. Polliniums eight, slender. Wight Ic. t. 1664.

In woods. Pulneys: close below Kodaikanal and in many other sholas. Nilgiris: Kotagiri, in Longwood shola. *Fyson* 1705. *Bourne* 280, 677, 2042, etc.

But not common at these elevations, much more frequent below, where another species *C. masuca* *Lindley* with purple flowers and stalkless leaves also occurs.

Gen. Dist. Deccan 6 to 7,000 feet, Canara, Ceylon and on to Malaya and Australia.

EULOPHIA. F.B.I. 148 XXXIX.

Ground orchids flowering often before the leaves appear. Leaves rising from a lateral bud, rather narrow, plaited, arranged spirally, and convolute in bud, and jointed at their bases. Flowers in tall racemes. Sepals and petals similar, narrow, and not spreading much. Column slender and long, curving forwards at the base. Lip with side lobes embracing the column, a middle lobe with raised ridges, and a short spur. Anther cap falling off completely. Polliniums two or four, attached by elastic straps to a thin oblong band fixed to an easily removed bit of the rostellum.

Species about 50, in all warmer parts of the world, especially tropical and South Africa, and Asia (one near Madras); but, also, in Australia two and in Brazil one. A few are cultivated.

Eulophia pratensis *Lindley*; *F.B.I.* vi 4, XXXIX 10; yellow Ground Orchid.

Flowering stem appearing before the leaves, 1 to 2 feet high; with a few sheathing scales, slightly swollen at their attachment to the stem; quite glabrous, green or purplish. Raceme 6 inches, the flowers about $\frac{1}{2}$ inch, apart. Bracts lanceolate, acute, $\frac{1}{2}$ inch: ovary plus stalk $\frac{3}{4}$ inch. Sepals elliptic, oblong, dirty yellow outside, purple inside, five-nerved. Petals nearly as long, obovate-oblong, clearer yellow. Lateral sepals attached by their $\frac{1}{8}$ -inch wide bases to the shortly projecting base of the column, on to which also run the front edges of the two petals. Side-lobes of lips embracing the column, each as wide as the middle lobe: middle lobe with three or four crested ridges running towards the opening of the short, triangular, backward pointing spur. Column deeply grooved, with the sides meeting across the middle at the top; rostellum sloping downwards. Anther cap with a short projecting point, quite free. Polliniums two, attached by thin elastic bands to the removable part of the rostellum, globose. Capsule $1\frac{1}{4}$ inches elliptic, turgid. Leaves long petioled, 10 to 12 inches. Wight Ic. t. 1666.

There appear to be two varieties, differing considerably in size:—

var 1 major. Sepals and petals 1 inch by $\frac{1}{3}$ inch: bracts $\frac{1}{2}$ inch by $\frac{1}{4}$ inch: ovary without a trace of purple.

Pulneys: on the Kodaikanal downs flowering March and April. *Fyson* 3100. *Bourne* 206, 1205, 1397.

Gen. Dist. Western side of South India, apparently endemic. Flowers in Bombay, November to February. [C.F.B.].

var 2 minor. Sepals and petals $\frac{1}{2}$ inch by $\frac{1}{5}$ inch, bracts $\frac{1}{2}$ inch by $\frac{1}{8}$ inch ovary tinged with purple.

I am however not very confident about this.

Eulophia nuda Lindl.; F.B.I. vi 5, XXXIX 18. A larger plant with leaf blades 12 to 15 inches long and sepals and petals 1 inch by $\frac{1}{4}$ inch. Wight Ic. t. 1690.

On the ridge above Silver Cascade, below Kodaikanal.
Bourne 1845, 1846.

ÆRIDES.

F.B.I. 148 LVIII.

Rock or Tree Orchids with stout perennial stem which continues growing at the end (monopodial growth). Leaves in two ranks and jointed to their bases. Flowers in lateral racemes from the axils of the leaves. Sepals and petals spreading. Lip divided distinctly into two parts, the forward one broad and jointed to the inner, which has erect side lobes and a spur and is itself attached to the prolonged base of the column.

Species about 50 in the tropics of Asia.

Flowers round : racemes spreading : on rocks. . . *A. crispum*.

Flowers narrow, $\frac{1}{3}$ inch wide by 1 inch long : racemes erect, shorter than the leaves : on trees . . . *A. radicosum*.

Ærides crispum *Lindley* ; *F.B.I.* vi 45, LVIII 8 ; pink Rock Orchid. Stem thick as the middle finger, covered with the bases of the fallen leaves. Roots as thick as the little finger, greenish white. Leaves thick and close-set, 3 by 1 inch, folded up along the midrib, very slightly notched and uneven at the end, green but with purplish blotches on the upper side. Racemes spreading or pendulous, longer than the leaves. Flowers rose-coloured, $\frac{3}{4}$ to $1\frac{1}{2}$ inches across. Sepals and petals broad, nearly round. Mid-lobe of lip nearly as broad as long, crisped along the margin : side lobes $\frac{1}{8}$ inch long, pointing forwards : central part with a slight ridge and two swellings where the lateral join the middle lobe. Column $\frac{1}{4}$ inch high, but produced in front nearly $\frac{1}{4}$ inch ; the side sepals attached by their whole width to its under side and the lip at the end ; upper part winged, the edges almost hiding the deeply sunk stigma. Cap of the anther projecting forwards as much its own width. Polliniums attached by very slender filaments to the strap, which

comes off the rostellum with a piece, ovate on one side bifid on the other. t. 248. Wight Ic. t. 1677 bis.

On exposed rocks. Common on the Pulney downs, about Kodaikanal. Nilgiris : Coonoor. *Fyson* 377. *Bourne* 1850, 1850.*

Gen. Dist. Western Ghats.

This is the Orchid commonly brought round for sale in Kodaikanal a practice which should not be encouraged, for collectors of this type are ruthless in their destruction. In any case a plant, when done with, should not be thrown away, even if only a piece of stem, but carefully planted in a crevice on some exposed rock.

Ærides radicosum A. Rich ; *F.B.I.* vi 46, LVIII 11 ; the larger rose Tree Orchid. Stem much as in *Ærides crispum*, bound to the tree by interlacing $\frac{1}{4}$ inch thick, dirty white roots. Leaves $\frac{3}{4}$ inch wide, 6 to 10 inches long, thick, strongly grooved, and when young folded down the midrib; slightly unequal at the tip; often spotted brown. Spike erect, usually shorter than the leaves. Flowers less than half as wide as they are long : pedicel and ovary 1 inch, curving back against the axis of the spike. Dorsal sepal erect, nearly flat, oval, $\frac{1}{5}$ inch : lateral $\frac{1}{4}$ inch, forming with the smaller petals very flat sides to the flower. Mid-lobe of lip $\frac{1}{5}$ inch, broad and long, contracted suddenly at both ends : lateral lobes $\frac{1}{16}$ inch, the part joining them with a double swelling. Spur $\frac{1}{4}$ inch, curved forwards, blunt. Column $\frac{1}{4}$ inch, very deeply grooved, or with thick white wings projecting at the base as much as $\frac{1}{8}$ inch : stigma shining, $\frac{1}{16}$ inch. Capsule on a stalk of $\frac{1}{2}$ inch, 1 by $\frac{2}{5}$ inch, three-angled, with a broad band down the middle of each side along one side of which it opens, and capped by the remains of the flower : placentas woolly. t. 249. Wight Ic. t. 1673 (*Saccolabium rubrum*) ; Ic. t. 917 (*S. wightianum*).

On trees, flowering before the rains. Nilgiris : Ootacamund in sholas common, and at lower levels to Pykara, and Kotagiri. Pulneys : rare on the downs. *Fyson* 2617. *Bourne* 2946, 4817.

Gen. Dist. Western Ghats.

Easily distinguished from *A. crispum*, by the narrow flowers, more shortly stalked spikes, and flat not curved lip; but most of all by being a Tree-orchid, growing always in the shade, while the other grows in the open on rocks.

SACCOLABIUM.

F.B.I. 148 LXI.

Sac-orchid.

Similar to the Rock Orchid, *ÆRIDES*, as regards the structure of the vegetative parts and the flower, and differing chiefly in there being no extended foot to the column, so that the lip, here comparatively small, is not carried out and is not divisible into two parts; and in the comparatively long, sac-like spur, which is the most conspicuous part of the flower.

Saccolabium filiforme *Lindley*; *F.B.I.* vi 56, LXI 3; yellow or pink Sac-orchid. Distinguished from all our other orchids by the slender green stems and round, stick-like leaves, and by the curved, drooping spikes of small, yellow-brown flowers, less than $\frac{1}{8}$ inch broad but with spurs twice as long, which hang down from their axils. Roots thick, white. Stem $\frac{1}{8}$ inch thick, green. Leaves more or less in two ranks 2 to 6 inches by $\frac{1}{10}$ inch or less, but tapering and sheathing the stem at the base. Spikes about 2 inches; flowers dense; bracts $\frac{1}{12}$ inch, acute; stalk and ovary $\frac{1}{4}$ inch. Spur $\frac{1}{5}$ inch, brown. Capsule slender egg-shaped, $\frac{1}{4}$ inch, its stalk $\frac{1}{4}$ inch, the remains of the perianth persistent at the top. t. 250.

In the sholas frequent. *Fyson* 1987, 3102. *Bourne* 298, 1180.*

Appears to be in two varieties:—

var nilgirica: flowers pink. Nilgiris: on the downs to Pykara and Neduwattum; flowers May, etc.

var pulneyensis: flowers yellow streaked brown. Pulneys: in sholas about Kodaikanal, not rare. Ceylon.

Gen. Dist. Also Central Provinces.

SPIRANTHES. F.B.I. 148 LXXXVII.*Lady's tresses.*

Ground orchids distinguished from all others by the spiral arrangement of the small white flowers on a twisted spike.

Rootstock with thick white roots, and ending above in the flowering and leafy stem. Leaves spirally arranged, not jointed at the base. Middle sepal and petals forming a hood over the short column, but not fused together: lateral sepals free, with more or less parallel nerves. Lip different in shape, hanging down vertically, small, oblong, concave, crisped, hairy at the middle, with short spur. Anther erect, attached to the equally long, erect rostellum, two-celled, with two waxy polliniums pendulous from the top.

Species about 80 in tropical mountains and in temperate regions. In England three, the commonest being *S. autumnalis* Lady's tresses.

***Spiranthes australis* Lindley ; F.B.I. vi 102, LXXXVII 1.** Stem 6 to 8 inches, rather slender. Leaves mostly near the base, 2 to 5 inches, narrow oblanceolate, acute, hardly $\frac{1}{2}$ inch wide, sheathing the stem for a short way. Stalk of spike slender; flowering part 3 to 6 inches, the flowers close together in a dense spiral, white. Sepals $\frac{1}{6}$ by $\frac{1}{16}$ inch: petals slightly shorter. Lip three-lobed, with two glands at the base. Capsule $\frac{1}{4}$ inch, ribbed. t. 251.

Pulneys: common on the Kodaikanal downs, flowers summer. Nilgiris: Pykara, flowers May and near Coonoor. *Fyson* 2017, 2923. *Bourne* 35.

Gen. Dist. On mountains throughout India, from the Punjab and Thibet to Ceylon and Chittagong. Eastwards to China, Japan, Australia, New Zealand; northwards to Afghanistan and northern Asia.

CHEIROSTYLIS.

F.B.I. 148 XC.

Terrestrial herbs with tuberous rootstock, extending upwards into the stem, which has a few spirally arranged, not jointed, leaves near the base, and ends in a raceme of small flowers. These with a comparatively large lip, but small sepals and petals, of which the median sepal and two adjacent petals are united as hood. Column short with two erect appendages in front, anthers erect. Polliniums two, with short caudicles.

Species about eight, in the East Indies, Malay archipelago and tropical Africa.

Cheirostylis flabellata Wight; *F.B.I.* vi 105, XC 5. Rootstock in appearance like artichoke, pinkish brown, lumpy. Stem hairy. Leaves $\frac{1}{2}$ to 1 inch, ovate-acute, sheathing at the base, three or five-nerved: upper reduced to scales with distinct sheathing portion. Flowers five or six, $\frac{1}{4}$ inch across. Lip bifid, each half deeply fringed. Capsule egg-shaped, $\frac{1}{4}$ to $\frac{1}{3}$ inch. Wight Ic. t. 1727.

In shady places. Nilgiris: near Ootacamund on Snowdon. Pulneys: Bearshola and Church Cliff shola, near Kodaikanal. Flowering April. *Bourne* 1225,* 1263,* 4778.

Gen. Dist. Higher mountains of India from Bhotan southwards to Tenasserim and Ceylon.

HABENARIA.

F.B.I. 148 CVI.

Ground orchids with tubers and thick roots. Leaves spirally arranged, clasping at the base, not folded along the nerves. Flowers in terminal bracteate spikes or racemes. Pollen sacs lying on either side of the column, and each enclosing one club-shaped or pear-shaped pollinium.

Species about 400 in temperate and tropical regions. In England, the Butterfly orchid.

a	{	Sepals spreading	. . . . .	b
	{	Sepals erect	. . . . .	i

- b { Petals divided, one or both halves hair-like c
- { Petals not divided : lip three-lobed or partite d
- { Flowers one or two only. Spur 2 inches. Lip of three slender parts p. 400. *H. rariflora*.
- c { Flowers many in a spike. Spur $\frac{1}{2}$ inch. Hair-like segments of petals curling up. pp. 399, 400. *H. foliosa* and *H. travancorica*.
- d { Side lobes of lip broader than the middle lobe e
- { Side lobes of lip not broader than the middle lobe f
- e { Flowers many, under 1 inch : lateral lobes of lip $\frac{1}{8}$ inch or less p. 401. *H. cephalotes*.
- { Flowers one or two only : spur 3 to 4 inches p. 401. *H. longicalcarata*.
- f { Flowers all facing one way : bracts embracing the flowers. g
- { Flowers spirally arranged h
- g { Leaves ovate 1 to 1 $\frac{1}{2}$ inches p. 403. *H. heyneana*.
- { Leaves linear 2 to 2 $\frac{1}{2}$ inches. . . . p. 403. *H. subpubens*.
- { Leaves two only, flat on the ground, thick p. 404. *H. crassifolia*.
- h { Leaves several, on the stem, flowers $\frac{1}{3}$ inch greenish white p. 402. *H. elliptica*.
- i { Lateral petals each with a filiform segment curling up (like a pair of horns) p. 404. *H. bicornuta*.
- { Petals entire : lip notched or cuspidate one spotted pink or purple p. 405. *H. obcordata*.

Habenaria foliosa *A. Rich. ; F.B.I. vi 135*, as variety *foliosa* of *H. digitata* *Lindl. ; CVI 7*.* Characterised by having two pairs of filiform segments of petals curling upwards like horns.

Tuber $\frac{3}{4}$ inch. Stem 6 to 10 inches, clothed at the base only with sheaths, above leafy. Leaves 1 to 2 inches, elliptic-ovate, acute, stem-clasping; upper smaller merging into the bracts. Flowers dirty white, in a dense spike 2 to 4 inches long. Bracts $\frac{5}{8}$ inch, ovate-acute, slightly longer than the ovary. Sepals $\frac{1}{4}$ inch; lateral pair ovate-acute, curved spreading; dorsal sepal round. Petals each divided into two filiform segments curved upwards like horns. Lips deeply three-fid into narrow hair-like segments, the middle one longest.

Stigmatic processes large straight. Pollen sacs curled upwards and outwards. Capsule $\frac{1}{2}$ inch. t. 252. Wight Ic. t. 1700.

In the open, on grass downs. Nilgiris : on golf links, etc., to Avalanche and Coonoor, flowering August.

Gen. Dist. Nilgiris and northward on the Ghats.

Habenaria travancorica Hook. f. ; *Herb. Wight Prop.* '*H. lindleyana*' ! ; *F.B.I.* vi 135, CVI 8. Characterised by having two pairs of horns (filiform segments of the petals curving upwards) and the inner side of the lateral sepals pubescent.

Stem 6 to 15 inches, lower parts naked ; basal sheaths few, rounded. Leaves 1 to 2 by $\frac{3}{4}$ to 1 inch, ovate-acute, uppermost narrower and acuminate. Raceme lax, 2 to 4 inches. Bracts $\frac{5}{8}$ to 1 inch, much longer than the ovaries. Lateral sepals $\frac{1}{4}$ inch, ovate-acute, pubescent on the inner side ; dorsal one round. Petals divided into two filiform segments which curl up like two horns. Lip three-partite. Spur $\frac{1}{2}$ inch, shorter than the ovary. Wight Ic. t. 922. (*H. lindleyana*).

Pulneys : on the open grass downs, flowering autumn. *Fyson* 2133. *Bourne* 1199.

Very similar to *H. foliosa*, differing mainly in the sepals being pubescent : and probably only a variety of it.

Habenaria rariflora A. Rich. ; *F.B.I.* vi 136, CVI 14. A small white flowered ground orchid remarkable for the long slender curved spur and the four hair-like segments projecting from either side of the flower.

Stem 4 to 8 inches, clothed below by the sheathing bases of the leaves. Leaves close to the ground, 3 to 4 inches by $\frac{1}{2}$ inch, oblong-lanceolate, acute, folded, clasping the lower part of the stem by their sheathing bases. Upper part of stem with only a few bract-like sheaths.

Bracts $\frac{3}{4}$ to $1\frac{1}{4}$ inches, narrow-lanceolate, acute. Pedicel $\frac{1}{2}$ to $\frac{3}{4}$ inch; ovary as long. Spur 2 inches, incurved. Sepals triangular spreading, the posterior $\frac{1}{4}$ inch acute. Petals each of two parts; the upper ovate-acute $\frac{1}{4}$ inch, the lower hair-like and twice as long, curved slightly upwards. Lip consisting of a narrow oblong middle lobe, $\frac{1}{3}$ by $\frac{1}{2}$ inch, from about the middle of which on each side a straight hair-like segment projects straight outwards (at half right and half left). Ovary usually not showing a twist. Pod 1 by $\frac{1}{5}$ inch. Wight Ic. t. 924.

In the grass of the open downs. Pulneys: above Kodai-kanal, flower July. Nilgiris: on the lower slopes. *Fyson. Bourne* 1192, 1856.

Gen. Dist. Bababooduns and Western Ghats.

Habenaria cephalotes *Lindl.*; *F.B.I.* vi 139, CVI 22. Tuber elongate. Stem 3 to 6 inches, and raceme 2 to 4 inches: base stout with one or two sheaths. Leaves two or three only, 2 to $2\frac{1}{2}$ by $1\frac{1}{4}$ inches, ovate; succeeded by much smaller ones. Spike dense 2 to 4 inches: bracts 1 by $\frac{1}{3}$ inch, lanceolate acuminate, longer than the ovaries. Lateral sepals $\frac{1}{5}$ inch, pubescent, spreading; dorsal smaller. Petals entire erect. Lip divided into three lobes: mid-lobe $\frac{1}{8}$ inch, narrow: lateral lobes $\frac{1}{8}$ by $\frac{1}{6}$ inch, with fimbriate margin. Spur curved forwards shorter than the beaked ovary. t. 253. Wight Ic. t. 1711.

In open grass land. Nilgiris: on the downs near Ootacamund and down to Avalanche. Not on Pulney downs. *Bourne* 4610.

Habenaria longicalcarata *A. Rich.*; *F.B.I.* vi 141, CVI 30; Elephant's Head. Distinguished by the large white flowers and very long spur.

Stem 12 to 18 inches, from an oblong tuber. Leaves few (four or five) close to the ground, oblong, acute, or broadly elliptic: stem above clothed with loosely

sheathing bracts nearly as long as the internodes. Flowers one to three only: pedicels 1 to $1\frac{1}{2}$ inches: bracts acute, sheathing, nearly as long: ovary as long. Petals and dorsal sepals erect: dorsal sepal green, three-nerved, with three recurved margins: lateral oblong curved or nearly semicircular, spreading down and backwards. Lip 1 to $1\frac{1}{4}$ inches, three-lobed; mid-lobe oblong, $\frac{1}{2}$ by $\frac{1}{8}$ inch; lateral lobes cuneate, toothed along the sloping end. Spur 4 to 5 inches, hanging vertically down but bent forwards at about the middle, and thicker below this. Anthers over $\frac{1}{4}$ inch, curved forwards and upwards. Filaments of polliniums over $\frac{1}{5}$ inch: pollen in large granular masses. Stigmas on two large shining fleshy green $\frac{1}{8}$ -inch processes, curving horizontally outwards in two semicircles and nearly meeting in front. t. 254. Wight Ic. t. 925. Curtis Bot. Mag. t. 7228.

In t. 254: α one caudicle and its gland is shown escaped from the anther-sac, and just the gland of the other.

On the open downs. Pulneys: near Kodaikanal common in places. Widely distributed on the uplands of South India, Mysore, etc., down to 2,000 feet. *Fyson* 3103. *Bourne* 256, 1998, 2345, 2951.

Habenaria elliptica *Wight, Herb. Wight. Prop.* 3071 !; *F.B.I.* vi 147, CVI 40; common small *Habenaria*. Tubers ellipsoid, $\frac{3}{4}$ to $1\frac{1}{4}$ inches: stem 8 to 24 inches, leafy. Leaves mostly near the ground but also on the stem above, lanceolate or elliptic, acute, 2 to 3 inches by $\frac{1}{2}$ to $\frac{3}{4}$ inch; the upper smaller and merging into the floral bracts, which are lanceolate acute, shorter than the ovary. Racemes dense, many flowered. Flowers small, $\frac{1}{2}$ inch across: ovary $\frac{3}{4}$ inch, curved forwards. Dorsal sepal and petals erect, arching over the column: lateral sepals spreading. Lip curled down, divided to near the middle into three nearly equal lobes: lateral lobes acute, dentate on the outer margin. Spur $\frac{3}{4}$ inch, slender above, below much thickened and curved forwards.

Stigmatic processes fleshy, deflexed down against the labellum. Wight Ic. t. 1706.

On the open grass downs. Pulneys : above Kodaikanal. *Fyson* 563, 1842, 3102, 3104. *Bourne* 487, 594, 1187, 1187,* etc. Nilgiris : Coonoor (*Gamble*). Not elsewhere.

Habenaria heyneana *Lindl.*; *F.B.I.* vi 148, CVI 53. Stem 6 to 10 inches, with two sheaths at the base. Leaves $1\frac{1}{2}$ by $\frac{3}{4}$ inch, ovate, stem-clasping, recurved : upper smaller, acuminate. Raceme 2 to 3 inches. Bracts broad, acuminate, sheathing the flowers. Flowers all facing one way, greenish-yellow. Dorsal sepal and petals arching : lateral sepals spreading. Lip three-partite curving downwards : lobes oblong $\frac{1}{5}$ inch, subequal on the middle one longer and broader. Spur as long or shorter than the ovary, which is not stalked. 'Turns black on drying.'

Nilgiris : on the downs to Pykara ; flowering summer. *Bourne* 4658, 4787.

Gen. Dist. Western Ghats.

Habenaria subpubens *A. Rich.*; *F.B.I.* vi 948, CVI 54. Characterised by straight not arching sepals and petals. 'Differs also from *H. heyneana* in not turning black on drying.'

A small herb, 6 to 8 inches. Tuber $\frac{3}{4}$ inch, oval. Base of stem with a few sheaths. Leaves two or three only 1 to $2\frac{1}{2}$ by $\frac{1}{4}$ to $\frac{1}{2}$ inch, upper smaller. Bracts $\frac{3}{4}$ to 1 inch, narrow, elliptic acuminate, boat-shaped. Flowers about four only to the spike, all facing one way, white. Sepals $\frac{1}{5}$ inch, oblong-obtuse, one-nerved ; lateral straight not arching. Petals nearly as long, acute. Lip three-lobed : middle lobe longest. Spur slender as long as the ovary. t. 255.

Nilgiris : near Ootacamund but not common.

Gen. Dist. South end of Western Ghats.

Habenaria crassifolia *A. Rich.* ; *F.B.I.* vi 151, CVI 63. Distinguished by the two nearly circular fleshy leaves spreading out flat at the base. Stem $\frac{1}{2}$ to 2 feet, from an oblong ellipsoid tuber, 1 to $1\frac{1}{2}$ inches long; leafless except at the base, but clothed with sheathing bracts which may overlap towards the top. Leaves two only, 1 to 2 inches, circular, fleshy. Flowering part less than half the whole: bracts lanceolate acute, $\frac{1}{2}$ to $\frac{3}{4}$ inch, shorter than the ovary. Ovary 1 inch, sessile. Flowers $\frac{1}{4}$ inch only, white. Dorsal sepal ovate-acute, arching: lateral sepals $\frac{1}{8}$ inch, oblong-obtuse, curved downwards.* Petals shorter and narrower ovate-acute. Lip three-lobed, lobes acute, entire or nearly so. Spur nearly as long as the ovary, club-shaped. Stigmatic processes short acute. t. 256. Wight Ic. t. 1694.

In damp places flowering June to September. Nilgiris: near Ootacamund, etc. Pulneys: just below Kodaikanal. *Fyson* 417, 697. *Bourne* 47, 1857, 4625.

Gen. Dist. Western Ghats northwards to Mableswhar. Closely allied to *H. platyphylla* of the plains near Madras.

Habenaria bicornuta *Hook. f.* ; *F.B.I.* vi 156, CVI 78; *Peristylus richardianus* *Wight, Herb. Wight Prop. 1*; yellow Two-horn. Stem up to 2 feet leafy to about the middle. Leaves $1\frac{1}{2}$ by 12 inches, narrow lanceolate acute, merging above into the bracts. Spike long, many-flowered, bracts $\frac{1}{3}$ inch, ovary $\frac{1}{2}$ inch. Flowers $\frac{1}{6}$ inch, yellowish green. Dorsal sepal $\frac{1}{8}$ inch, arched like a hood. Lateral sepals as long, obtuse. Petals a little shorter. Lip three-partite. Lateral segments long and linear, curled at first like ram's horns, then erect and curved like a buffalo's; middle segment $\frac{1}{8}$ by $\frac{1}{12}$ inch, oblong-obtuse, thick, with three swellings at the base, the middle one curving over the entrance to the

* Incorrectly figured by Richard in *Ann. des. Sci. Nat. 2nd Ser. xv. t. 3.*

spur. Spur $\frac{1}{4}$ inch, half the ovary. Column about $\frac{1}{16}$ inch. Leaves and flowers dry black. t. 257. Wight Ic. t. 1097.

Pulneys : Pillar rocks and down to Shembaganur. *Fyson* 1179, 2055, 3105. *Bourne* 1184.

Habenaria obcordata ; *Platanthera* obc. *Lindl.* ; *F.B.I.* ; as *Habenaria galeandra* and *Habenaria jantha*, vi 163 and 164, CVI 100 and 101 ; common purple ground-orchid. Stem 6 to 10 inches, leafy throughout, glabrous, green but purplish at the base. Leaves ovate-acute, stem clasping, 1 to 2 by $\frac{3}{4}$ to 1 inch, merging upwards into bracts. Bracts leaf-like, longer than the ovary. Sepals and petals erect, arching over the column. Spur short and broad, sac-like. Very variable in size and in the size and shape of the lip, which may be from $\frac{1}{3}$ to 1 inch, and from cuspidate to deeply notched. t. 258.

* *var typica*, *Wall. Cat.* 7050. Lip $\frac{1}{3}$ inch wide, cuspidate ; bracts longer than the flowers.

** *var nilagirica*, *Wight Ic.* t. 1693. Leaves rather broader, bracts less spreading.

*** *var galeandra*, *Reichb., Wall. Cat.* 7050 'Silhet'. Bract not much longer than the flowers. Lip as in *var typica*, nearly as broad, cuspidate. Stem green, spotted with purple, and at the base quite purple. Leaves broad, green with purple nerves. Lip white with purplish spots. [*Wight Ic.* t. 1693 (*P. affinis*) is of a poor specimen approaching *var typica*. *Wight Ic.* t. 1692, *H. jantha*, is of a finer plant].

Pulneys : near and below Kodaikanal. *Fyson* 1837, 3106. *Bourne* 442, 1188, 1997.

**** *var jantha* *Hooker ms. on Herb. Wight Prop.* 1031 ! not of *Wight*. Lip larger, up to 1 inch across, and longer, deeply notched with or without a central point, but not cuspidate. Stem dark purplish-red. Leaves green with red nerves. t. 258. (b : fruit.)

Pulneys : Kodaikanal downs. Travancore (*Wight Kew Dist.* 3025). *Fyson* 458, 3107. *Bourne* 585, 1189, 2954.

The lip of this variety is very similar to that of *P. helleborina Rolfe* (*Fir. Trop. Afr.* viii 204), which species however is different in foliage.

The last two varieties (***) and ****) grow together on the Kodalkanal downs and are very distinct, though intermediates (possibly hybrids) occur.

Considerable confusion has been introduced by the plant being given different names by workers in different localities and by such workers identifying the plant wrongly. *P. obcordata* Lindley was founded on a Nepal plant. *P. galeandra* Reichb., in 1852, on a Hongkong one. *P. Jantha* of Wight's description is his Ic. t. 1692, and not the plant named so by Sir J. D. Hooker (ms. on Wight's sheet No. 1031). Both Wight's Ic. t. 1692 and t. 1693 have the cuspidate lip of *P. galeandra* Reichb. and of *obcordata* Lindl. in Wall. Cat. 7050. On the other hand the only sheet of Wight's marked '*Jantha*,' is the type of his Icones t. 1692 and is a fine specimen of the *H. galeandra* of F.B.I. *Jantha* therefore appears to be an unfortunate name for the plant meant by the name in F.B.I. and also here, because originally given by Wight to what Hooker calls in F.B.I. *H. galeandra*, identifying it with *P. galeandra* Reichb., a Chinese plant; but it must be retained since described in the F.B.I. Krauzlin in his monograph of the orchids, vol. I, p. 613, appears not to have seen our plant, which is that named by Hooker *H. Jantha*, and appears to have merely followed Hooker's description, quoting Wight's Icones t. 1692, though Hooker did so with a question mark.

SATYRIUM.

F.B.I. 148 CIX.

Twin-spur.

Ground orchids allied to HABENARIA (q.v.) and distinguished by having two spurs hanging down on either side from the lip which is on the upper or posterior side of the flower, because the ovary is not (as is usual) twisted. Polliniums therefore with their stalks pointing upwards.

Species 10 in south and tropical Africa, Madagascar.

Satyrrium nepalense Don; F.B.I. vi 168, CIX 1;
Pink Twin-spur.

Stem up to 2½ feet. Basal leaves very large, up to 5 or even 7 inches by 3 to 4 inches, broadly ovate with sheathing base; upper leaves smaller. Spike very dense: bracts longer than the ovary, lanceolate. Flowers pink: posterior lateral sepals reflexed: anterior odd sepal (in most orchids posterior) narrow, curved down in front between the similar but broader petals. Lip erect curved as a hood over the column; spurs slender, ½ inch. Column curved forwards with two

minute lobes on either side. Anther sacs nearly globular. Stigma above them. Wight Ic. t. 1716.

Nilgiris: on the downs abundant after the summer rains. Pulneys: near Kodaikanal and on the downs. *Fyson* 3108. *Bourne* 504, 1858*, etc.

Gen. Dist. Widely distributed on the mountains of India, Burma and the Malay Peninsula.

DISPERIS.

F.B.I. 148 CX.

Ground orchids akin to HABENARIA (q.v.) but with the posterior sepal and petals united as a small rounded hood, from underneath which project two spreading petal-like lobes of the lip which is adherent to the short column. Anther lobes sheathing the polliniums spirally twisted and projecting outward on either side. Stigmas on a thin membrane connecting these across the top of the column.

Species 20 in Africa and two in South India.

Disperis neilgherrensis Wight; *F.B.I.* iv 160, CX 2. Stem about 6 inches, leaves few, $\frac{3}{4}$ to 1 inch, ovate, stem-clasping. Stem above with sheaths. Flowers white or reddish spotted with crimson: hood $\frac{1}{4}$ inch. Lateral sepals $\frac{1}{2}$ inch. Projecting arms of the lip papillose, curved back. Wight Ic. t. 1719.

Nilgiris: near Ootacamund. *Bourne* 5252. *Wight. Hohe-nacker.*

Gen. Dist. Mysore and South India generally.

ZINGIBERACEÆ.

In *Gen. Plant.* and *F.B.I.* a tribe of the SCITAMINEÆ.

Herbs with perennial rootstock and stalked leaves arranged in two ranks with sheathing bases and at the junction of blade and stalk a small thin flap (*ligule*).

Flowers in racemes, heads or cymes, in the axils of leafy bracts, and sheathed by tubular bracteoles. Sepals three, united at the base. Petals three, separate. Stamen one, at the back of the flower, with a large anther between the two lobes of which lies the style: behind this two petaloid staminodes: in front a two-lobed or bifid lip (often the most conspicuous part of the flower) composed of two staminodes. Ovary inferior, three-celled: style slender. Fruit a loculicidal capsule. Seeds with perisperm.

Species 275 in the tropics mostly of India and the Malay regions. Commonly cultivated genera are ZINGIBER Ginger, CURCUMA Turmeric, Elettaria Cardamom.

The family (or tribe) is closely allied to the CANNA of our gardens but differs in having a completely two-celled anther, and the lip being symmetrically placed opposite it and being composed of two staminodes.

CURCUMA.

F.B.I. 149 VI.

Turmeric, etc.

Herbs with tuberous rootstock but no leafy stem above ground. Leaves radical, oblong, often large. Flowers several together in the axils of large bracts, arranged in a dense raceme which ends in coloured empty bracts. Calyx-tube short. Corolla tube funnel-shaped, the upper (posterior) petal larger and more concave. Filament of stamen united to the two large posterior staminodes. Cells of the anther spurred at the base. Lip roundish. Capsule globose, three-celled. Seeds usually with aril.

Species about 50, mostly in tropical Asia but also Africa and Australia.

Curcuma neilgherrensis Wight, *Herb. Wight Prop!*; F.B.I. vi 210, VI 2. Rootstock tuberous, clothed with thin

brown scales, the new tubers lateral. Leaves not visible at time of flowering, many nerved.

Flowering stem 4 to 7 inches sheathed below by the undeveloped leaves, and with a few bracts below the spike. Bracts about 1 inch by $\frac{1}{3}$ inch, adnate to the axis at the base and very concave, many nerved, white tinged more or less with pink especially at the top. Flowers sessile, in threes in the lower bracts, solitary in the upper. Calyx tubular, $\frac{1}{3}$ inch, unequally three-lobed. Petals 1 inch, connate half way, very thin, with about five reddish veins. Stamines lemon yellow, the most conspicuous part of the flower, but scarcely exceeding the petals; the two upper, oblanceolate obtuse, erect and curved backwards; two lower one forming the deeply bifid lip. Stamen three-fourths the length of the upper stamens and attached to the staminal tube at the same level as them; anther about $\frac{1}{8}$ inch, with a small yellow crest at the top and two short lateral spurs at the base. Style very slender, curved against the flower-tube, and passing between the halves of the anther; stigmatic head projecting from between them just below the crest, rounded, rather larger behind and bearing the round hollowed stigma in front. Ovary three-celled, seeds in two rows in each cell, axile.

At the time of flowering the plant is almost white, with at the top a number of pink very delicate bracts, which spreading out are very conspicuous. A very pretty plant t. 259. Wight Ic. t. 2006.

Pykara near the river at 6,600 feet, flowering early in May. *Fyson* 2716.

Gen. Dist. Western Ghats, especially the south-west slopes of the Nilgiris.

Wight's specimen has large leaves, but most of those at Kew have no leaves with the flower, as I found.

In t. 259 : above flower and sect. of ovary; below anther from in front and the side, surrounding the style and stigma.

HÆMODORACEÆ.

A small family very similar to the LILIACEÆ but differing in the petals and sepals being joined at the base into a perianth tube, the ovary and fruit being more or less inferior, and the embryo not surrounded by endosperm but intruded into it.

Several genera including the one here are by some placed in the LILIACEÆ.

OPHIOPOGON.

F.B.I. 150 III.

Herbs with stout perennial rhizome, narrow radical leaves and leafless flower-stem. Ovary inferior. Sepals and petals free above it, spreading widely. Stamens six, attached to the base of the sepals and petals, and shorter than them. Anthers linear, longer than their filaments, opening at the sides.

Species 4 in India eastern Asia and Japan.

Ophiopogon intermedius Don ; *F.B.I.* vi 269, III 5. Leaves all from the rootstock narrow and grass-like. Flowering stem up to 15 inches : flowers pendulous in a loose raceme. Bracts $\frac{1}{4}$ inch. Pedicel $\frac{1}{3}$ inch. Corolla $\frac{1}{2}$ inch. Ovary deeply six-lobed. Style grooved.

On the outskirts of our area. Nilgiris : Kotagiri. Pulneys : below Kodaikanal, Shembaganur, etc., rare above. *Fyson* 504, 266. *Bourne* 403, 574.

Gen. Dist. Himalayas, Khasia, and West Coast hills.

The species was founded on the Nepal plant from which ours appears to me indistinguishable.

AMARYLLIDACEÆ.

Herbs with perennial rootstock or bulb, mostly radical leaves, and usually perfectly regular flowers with three sepals and three petals (or six similar parts), six stamens, an inferior ovary of three cells each with

many seeds, and dry capsular fruit. Very similar therefore to the LILIACEÆ except in the inferior ovary, and also that the flowers are usually umbelled and in bud enclosed in a large thin, or scarious, bract (*spathe*); (sometimes one flower only to the bract).

Genera 64. Species 700.

Common garden plants on the plains : CRINUM and PANCRA-
TIUM (White Lilies), EUCHARIS. In England and on these hills :
Amaryllis, Narcissus, Daffodil, Snowdrop, AGABANTHUS, etc.

CURCULIGO.

F.B.I. 152 II.

Yellow Ground Star.

Small herbs with tuberous rootstock and star-shaped flowers close down among the narrow plaited leaves, and remarkable for the sepals, petals, stamens and style being carried up on a short or long solid stalk above the ovary. Stamens short : anthers linear, fixed by the back. Style short : stigmas three, erect, stout. Fruit more or less beaked indehiscent.

Species about 12 in the tropics.

Ovary not visible above ground : solid stalk of perianth above it long : leaves glabrous C. orchoides.

Flowers racemed. Stalk of perianth short, ovary therefore visible : leaves villous finlaysoniana.

The long thick roots show transverse wrinkling. This is due to a contraction by which the plant is pulled deeper into the ground each year, as the rootstock grows in height, so that the leaves are kept at the ground level.

Curculigo finlaysoniana Wall; F.B.I. vi 279, II 4.
Leaves villous. Flowers in lax racemes, well above the ground. Solid stalk of perianth short, ovary therefore close below the sepals and petals. Upper flowers male only. Pedicels in fruit $1\frac{1}{2}$ inches.

Pulneys : Kodaikanal to Silver Cascade. *Bourne* 1229.

Gen. Dist. Also Ceylon.

Curculigo orchioides *Gærtn.*; *F.B.I.* vi 279, II 5. Rhizome stout, vertical: roots thick wrinkled. Dead leaves very fibrous. Leaves 3 to 4 by $\frac{1}{2}$ to $\frac{3}{4}$ inch, linear elliptic or lanceolate, deeply ribbed and folded, with long scattered hairs. Flowers $\frac{1}{2}$ to $\frac{3}{4}$ inch across, yellow, close down among the leaves; ovary underground, small. Solid stalk of perianth long, slender. Capsule $\frac{1}{2}$ inch, oblong one to four seeded, with slender beak. Seeds ' $\frac{1}{8}$ inch, deeply grooved in wavy lines, black, shining.' Upper flowers male, with stamens only. t. 260. Wight Ic. t. 2043.

In damp places. Pulneys at Kodaikanal in Tinnevely, Marsh, etc. *Bourne* 39, 1005.*

Gen. Dist. Sub-tropical Himalayas, Khasi hills, Western Ghats, Java, Phillipine (in these last two areas with glabrous leaves).

ZEPHYRANTHES.

142 II.*

Bulbous herbs with tall leafless flowering stem (scape) bearing one flower in the axil of a spathe. Perianth funnel-shaped with short tube. Capsule sub-globose or depressed three-lobed, loculicidally three-valved. Seeds oblong, black.

Species about 30 in the warmer parts of America from Bolivia to Texas and Mexico, one also in western tropical Africa. Several are cultivated and thus spread all over the world.

Zephyranthes carinata *Herb.*; II* 2. 'Pink Lily.' Scape about 12 inches. Leaves narrow, as long. Flowers $2\frac{1}{2}$ inches. Spathe $1\frac{1}{2}$ inches, split open about one-third.

Nilgiris: Ootacamund, Coonoor, etc.; common on road sides as a garden escape. *Fyson* 2944.

Z. tubispatha *Herb.*; II* 1. A smaller plant with spathe split on both sides is common in gardens, and also apparently naturalised, on the plains.

LILIACEÆ.

Herbaceous or woody plants with underground rhizome tuber or bulb, and leaves of various kinds. Flowers quite regular, with all parts in threes: three sepals, three petals (sometimes all six alike), six stamens opposite these, and a superior ovary of three cells, each with many seeds.

A very large family of about 200 genera and 2,500 to 3,000 species, in all climates and countries. Nearly allied to the AMARYLLIDACEÆ (q.v.) from which it differs chiefly in the ovary being superior.

The family is divided into eleven main sections arranged according to the nature of the fruit and the underground tuber or bulb, and includes among garden plants, the Tulip, Hyacinth, Onion, Aloe, and Funkia, in all of which the fruit is a dry capsule; and the Lily of the Valley, Solomon's Seal and Asparagus) with berries.

Climbers with heart-shaped leaves	SMILAX.
Stems green, branches slender needle-like	ASPARGUS.
Small herb: flowers in irregular racemes	CHLOROPHYTUM.
Stem 2 feet leafy: flowers solitary, large	LILIUM.
Stem branched, leafy: flowers pendulous	DISPORUM.

SMILAX.

F.B.I. 156 I.

Climbing plants with heart-shaped three-nerved leaves, and small unisexual flowers in umbels on axillary branches. Fruit a berry.

Species about 200 in all parts of the world (*Sarsaparilla*, Prickly Ivy. *Fr.* Clariege; *Ger.* Steckwinde).

The garden 'Smilax,' is really a RUSCUS and more nearly allied to ASPARGUS.

Smilax aspera Linn., *var maculata*; *F.B.I.* vi 306, I 12. Stem prickly (or not), as also the leaf-stalks and nerves underneath. Leaves blotched, five to nine-nerved, ovate deltoid or lanceolate, with rounded-cordate or hastate base. Stalk $\frac{1}{2}$ to 1 inch. Flowers in small umbels in slender axillary spikes of 2 to 6 inches. Bracts $\frac{1}{4}$ inch: bracteoles minute. Flowers white, sweet-scented; buds

longer than their pedicels : male sepals $\frac{1}{6}$ inch, female smaller. Berry $\frac{1}{4}$ to $\frac{1}{3}$ inch, red at first, turning black or blue. t. 261. Wight Ic. t. 2059.

Nilgiris : Ootacamund and below, flowering January. More frequent at lower levels, Pykara, Karteri, Kotagiri, Coonoor. Pulneys : not on the Kodaikanal downs, but below at level of Shembaganur, etc. *Fyson* 654, 1042, 1740, 2583. *Bourne* 163.

Gen. Dist Throughout India, from Kashmir to Khasia, Travancore, etc.

ASPARAGUS.

F.B.I. I III.

Asparagus.

Herbs with stout creeping rootstock, and slender ribbed or grooved green stems, with no true leaves, but the latter reduced to small, sometimes spine-tipped, scales subtending a bunch of narrow green needle-like spiny or flattened branchlets (*cladodes*). Flowers small, with jointed stalks, in the axils of scales : of the type usual in this family. Fruit a globose berry, enclosing two to six seeds with black brittle testa.

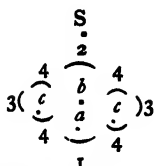
Species about 100, in the Old World, both temperate and tropical, mostly in dry places.

Asparagus subulatus *Steudel* ; *F.B.I.* vi 315, III 6. Stem erect, tall, smooth, with straight thorns, above each of which is a small scale, and a branch. Cladodes six to twelve together, $\frac{1}{6}$ to $\frac{1}{3}$ inch long, angled, stiff. Flowers solitary, one on each side of a branch on short stalks which are jointed above the middle. Berry $\frac{1}{3}$ inch. t. 262. Wight. Ic. t. 2053 (*A. asiaticus*).

On the Nilgiri and Pulney downs. Peculiar to these hills. *Fyson*. *Bourne* 254, 1250,* etc.

The spine is really a short branch (*a*) arising in the axil of the thin scale (*1*) but breaks through this as it develops, as will be seen on examining the youngest parts. At the back of the branch is another thin scale (*2*) this is really a leaf on the spine, and in its axil the branch (*b*) is developed. Round the base of each short flower-stalk (*c*) are three small scales, the one

to the outside (3) being the bract of the flower the other two (4) the bracteoles,



Ground plan of spines and scales. S=stem.

CHLOROPHYTUM.

Asphodel.

Herbs with short rhizome (not bulb) with fibrous sometimes fleshy roots, crowded radical leaves, and bunches of flowers in leafless racemes. Sepals and petals three to seven-nerved, spreading out flat like a star, and persistent after withering. More especially distinguished from other genera by each cell of the ovary having two ovules and the capsule being three-angled with flat sides.

Species about 40 in tropical and sub-tropical regions.

The true *Asphodel* of Europe differs in the flowers being one to each bract of the raceme not a bunch of two or more as here.

***Chlorophytum malabaricum* Baker, *Lour on Bababoodons* !; *F.B.I.* vi 335, XV 8; White *Asphodel*.**

A small herb with short stem clothed with the bases of the leaves, and thick white roots. Leaves all from the ground, lanceolate, acute, usually folded along the middle line, but without midrib, many-nerved, glabrous, and bluish. Flowers usually in pairs, one opening much before the other, in the axils of bracts, racemed in a short spike, which rises without leaves from the centre of the plant. Bract $\frac{1}{2}$ inch, acuminate, three-nerved, thin, longer than the pedicel. Pedicel shorter than the bract, not jointed. Flowers star-shaped, $\frac{5}{8}$ inch across; sepals $\frac{1}{3}$ inch, broadest above the middle, with midrib greenish and raised into a slight keel at the end. Petals similar,

quite white. Filaments two-thirds as long, white, glabrous, stiff, thinner just below the anther: anther $1/16$ inch, yellow, attached very near the base. Style thickest about the middle, thinner above: stigma terminal, punctate. t. 263.

Common on grass. Nilgiris: at Pykara, flowering May. *Fyson* 2482. *Bourne* 4783.

Gen. Dist. Western Ghats from Canara southwards.

LILIUM.

F.B.I. 156 XXI.

True Lily.

Bulbous plants, with erect more or less leafy stem. Flowers few, at the end of the stem, large, pendulous or horizontal, bell-shaped. Anthers attached by their backs, versatile. Fruit a loculicidal capsule.

Species 45, all in north temperate countries. The common White Lily of gardens on the plains of India is a CRINUM (family AMARYLLIDACEÆ).

Lilium neilgherrense Wight; *F.B.I.* vi 350, XXI 3; the Nilgiri Lily. Stem $1\frac{1}{2}$ to 3 feet. Leaves 2 by $\frac{1}{2}$ inch, narrow-lanceolate acute, three-nerved. Flowers solitary, 6 by 4 inches, bell-shaped, horizontal.

Common on the open downs, flowering July to October. *Fyson* 522, 532. *Bourne* 62, 2024.

Peculiar to South India, not northwards in the Bombay Presidency.

The bulbs should not be moved while the plant is in flower, nor until the leaves have died down, and if it is desired to plant them elsewhere a stake should be put to make the place, and the bulb dug up later. Lily bulbs are delicate movers and this species will not grow in the plains.

DISPORUM.

F.B.I. 156 XXXII.

Herbs with creeping rhizome and erect branched leafy stems, clothed below only with sheathing scales. Leaves sessile or shortly stalked not stem-clasping, net-veined between the many nerves. Flowers solitary or in pairs, narrow bell-shaped, pendulous, soon falling. Sepals and petals not connected, sometimes saccate at the base. Anthers opening outwards. Fruit a berry.

Species 12, in North America and mountains in the tropics of Asia ; one or two in Japan.

Disporum leschenaultianum Don 3!; *F.B.I.* vi 360, XXXII 3; Nilgiri Solomon's Seal. Stem up to 4 feet, $\frac{1}{3}$ inch thick at the base, tinged purple : clothed for a couple of inches or more above the nodes by the persistent sheathing scales. Upper, leafy part, repeatedly forked, with divergence of about half a right angle. Leaves broadly ovate, acuminate, 2 by 2 inches, quite glabrous, thin, glossy : nerves about seven, curving from base to apex, deeply indented above. Flowers drooping on stiff decurved pedicels, solitary in the upper leaf-axils or bunched. Sepals and petals $\frac{1}{8}$ to $\frac{5}{8}$ inch, elliptic, acute strongly keeled. Stamens six-erect : filaments $\frac{1}{6}$ inch stiff : anthers $\frac{1}{8}$ inch. Style longer : stigmatic branches three, $\frac{1}{6}$ inch. Berry dark blue, $\frac{1}{2}$ inch, very slightly three-lobed. t. 264. Wight Ic. tt. 2048, 2049.

Sholas, common on the Kodaikanal and Ootacamund downs. *Fyson* 509, 695, 2610, 2630, 2153. *Bourne* 37, 795, * 4591.

Gen. Dist. Also Ceylon. Rare in the Bombay Presidency.

The flowers face downwards and must therefore be visited from below. A pocket is formed between each stamen and the keeled or saccate base of the sepal or petal opposite it, and in this honey may be secreted. A proboscis inserted here could not fail to touch the anthers, and be dusted by pollen, since they open outwards and the filaments are very stiff.

The true Solomon's Seal of Europe (*Ger.* Weisswurz) is a POLYGONATUM, a nearly allied genus.

XYRIDACEÆ.

A small family of about 50 species mostly belonging to one genus.

XYRIS.

F.B.I. 159 I.

Tufted herbs with stiff radical leaves and slender leafless flowering-stems (scapes) ending in a small cone of brown bracts from among which arise one at a time, yellow flowers with three small scarious sepals, three

petals with erect claws and spreading blades, three stamens opposite to the petals, and a three-celled superior ovary ripening into a capsule with many seeds.

Species 40 or less, in the warmer parts of the world especially of South and North America, but absent from Europe. India has seven.

Named from the Greek XYRIS, sharp, because of the stiff narrow leaves.

Xyris schoenoides Mart. ; Wall. Cat. 60841; F.B.I. vi 365, 15. Perennial herb, tufted and often forming a turf. Leaves slender less than $\frac{1}{6}$ inch, broad, shorter than the striate, compressed, 8 to 12 inches, scape. Flower $\frac{1}{2}$ inch. Two lateral sepals smaller than the front one, enclosing the tube of the corolla. Petals yellow, not falling quickly, joined at the base into a thin narrow tube. Outer stamens, those alternating with the petals, reduced to hairy staminodes; inner three attached to the top of the corolla tube, their anthers fixed by their backs. Ovary one-celled, with three parietal placentas. Style slender, and dividing into stigmatic arms points outwards. Fruit a capsule enclosed in the dry corolla tube, and splitting open between the placentas in three valves. Seeds numerous, egg-shaped, longitudinally ribbed, with minute embryo at the further end from the placenta, the radicle pointing outwards. t. 265.

Pulneys: on the downs in damp places. *Fyson* 471. *Bourne* 591, 692, 1757.* Nilgiris.

Gen. Dist. Himalayas in Nepal, Khasi hills, Ceylon, China.

COMMELINACEÆ.

Herbs with usually zigzag stems and alternate entire leaves with large sheathing bases and parallel nerves. Flowers variously arranged, more or less irregular. Sepals three green. Petals three, free or united into a tube at the base, spreading, persistent after fading. Stamens six, all perfect or two or more sterile as

staminodes; filaments often bearded with long hairs. Ovary superior, typically three-celled, but often with one cell aborted or not as fertile as the others. Style terminal, stigma small. Fruit a loculicidal capsule or indehiscent. Seeds angled.

Species 300 in tropical and sub-tropical regions.

COMMELINA.

F.B.I. 160 II.

Stem slightly zigzag or straight. Flowers several together in small scorpioid (curved) cymes sheathed in a comparatively large heart-shaped bract (*spathe*), folded almost flat along the midrib. Stamens three only fertile, two or three sterile. Ovary of two cells, or with a third imperfect cell.

Species 100 in tropics and sub-tropics.

***Commelina clavata* Clarke ; F.B.I. vi 371, II 10.** Stem slender. Sheaths of leaves 1 inch, strongly ciliate. Leaves $1\frac{1}{2}$ to $2\frac{1}{2}$ inches by $\frac{1}{4}$ inch, contracted at the base. Stalks of cymes $1\frac{1}{2}$ inches, slender. Spathe $1\frac{1}{4}$ inches by $\frac{3}{4}$ inch (when opened out flat). Capsule four-angled, shortly oblong, of two cells each with two-seeds.

Pulneys: on the downs above Kodaikanal. *Fyson* 358. *Bourne* 1871.

I am not confident about the identification of my Pulney specimen, from which the above description was taken, since my leaves are narrower than the type sheet and the capsule does not show a constriction at the middle as described by Clarke. The species occurs on the Nilgiris near Kaiteri and on Lamb's Rock, Coonoor. Clarke gives the distribution as Western Ghats from the Concan southwards to Ceylon.

***Commelina kurzii* Clarke ; F.B.I. vi 373, II 17.** Stems 1 to 2 feet hairy, slender. Leaves $2\frac{1}{2}$ to 6 inches by $1\frac{1}{4}$ inches, grass-like, acuminate. Spathes when open $\frac{5}{8}$ inch broad, and with the long point about twice as long. Petals blue. Capsule with dorsal cell scabrid.

Pulneys: in and near Kodaikanal. *Bourne* 1239, 1872.

Gen. Dist. Malabar, Nilgiris and Ceylon.

Commelina cœlestis Willd.; *F.B.I.* vi 369, II 21. Stem 2 feet. Leaves 5 to 6 by 1 inch at base: sheath 1 inch wide with ciliate mouth. Spathe $1\frac{1}{2}$ inches acuminate, $\frac{3}{4}$ inch at widest point when folded. ($1\frac{1}{2}$ inches when open). Flowers deep blue very large. t. 266.

A native of Mexico. Cultivated in gardens and occurring in Ootacamund and Kodaikanal as a garden-escape by road-sides. *Fyson* 1812. *Bourne* 4637.

For fertilization see *Koerner Nat. Hist. of Plants*, Vol. ii, p. 357.

ANEILEMA.

F.B.I. 160 III.

Stem simple or branched: roots often tuberous. Flowers in axillary or terminal panicles with small bract and bracteoles. Sepals three, membranous. Petals three, obovate, equal, free or slightly united. Stamens two or three with filaments naked or bearded: anthers oblong one often larger. Staminodes three. Ovary two or three-celled. Capsule loculicidal: seeds in one or in two rows, with thick, hard, rough skin.

Species 60 in the tropics and sub-tropics chiefly of Asia.

Aneilema pulneyensis *Fyson* No. 435; III 9.* Roots long not succulent; plant spreading by lateral budding of the rootstock. Stem 4 to 8 inches leafy below, glabrous. Leaf-sheaths $\frac{1}{2}$ inch; blades $1\frac{1}{2}$ to $2\frac{1}{2}$ by $\frac{1}{4}$ to $\frac{1}{3}$ inch. Flowers in open cymose panicles: bracts $\frac{1}{16}$ inch persistent. Flowers $\frac{1}{4}$ inch: petals obovate (more obtuse and larger than in *A. esculentum* Wall.), with long narrow claw, and connate at the base of the blades; very thin and conspicuously veined. Stamens three, with bearded filaments. Staminodes three without beards, their heads deeply three-fid into rounded lobes. Stigma small. Ovary with one row of seeds in

each cell. Capsule oblong obovoid. Seed 5 to 6 inches in each cell, one-seriate. t. 267.

Pulneys: on the downs. *Fyson* 435. Wall. Cat, 5208 C. 'Herb. Heyne.'

Very close to *A. esculentum* Wall. (F.B.I. III 9) but differs in the roots being long and not fleshy, and the petals larger and more obtuse.

CYANOTIS.

F.B.I. 160 V.

Flowers many, in the axils of bracts in a double series forming a scorpioid cyme, with petals and stamens alone exserted. Sepals keeled, lanceolate. Petals joined below into a narrow tube. Stamens six, all perfect, with oblong anthers: filaments bearded with long hairs and thickened at the top. Ovary equally three-celled, each cell with two ovules, one pendulous from the top, the other erect from the base: seeds angular, rough with small pits: embryo at the end furthest from the placenta, with radicle pointing outwards, in fleshy endosperm.

Species, 30 to 35 in the warmer parts of the Old World.

Stems from the rootstock sprawling flat on open and dry ground, grey with cottony hairs C. *arachnoidea*.

Stems erect or spreading, in the shade of woods, very leafy and leaf-margins silky C. *villosa*.

Stems erect or spreading in the open C. *wightii*.

Cyanotis wightii *Clarke*; F.B.I. vi 386, V 6. Roots thick: stems 2 to 3 feet. Leaves 4 to 18 inches by $\frac{1}{3}$ to $\frac{3}{4}$ inch, sparsely hairy. Flower clusters dense, often long-stalked. Upper bractiform leaves $\frac{3}{4}$ to $1\frac{1}{2}$ inches lanceolate acuminate. Bracteoles ovate acuminate, curved. Filaments of stamens bearded. Wight Ic. t. 2084.

Pulneys, on the slopes of Gundan shola above Kodaikanal. *Fyson*. *Bourne* 1242, 1243.

I was unable to match my specimen at Kew, so give this name under reserve.

Cyanotis arachnoidea Clarke, *Wight's Kew Dist. No.* 2839 !; *F.B.J.* vi 386, V 7; White Spider Legs.

Branches or stems half erect or sprawling on the ground, 10 to 20 inches, covered all over as also the leaves with fluffy white cottony or silky hairs. Leaf-stalks $\frac{3}{4}$ inch. Blades 2 by $\frac{1}{3}$ to $\frac{1}{2}$ inch, tapering evenly from the base to near the apex. Cymes $\frac{1}{2}$ to $\frac{3}{4}$ inch, terminal, with a leaf or bract just below, and in the upper leaf-axils one or more. Stalked or sessile. Bracteoles lanceolate, curved, $\frac{1}{3}$ inch. Filaments bearded. Style bearded and thickened below the stigma. Capsule oblong: seeds elongate-conical, obscurely pitted. t. 268. (Not Wight Ic. t. 2083).

In dry places. Nilgiris: Avalanche; Coonoor. Pulneys: on the downs above Kodaikanal, near the observatory, etc., flowers summer. *Fyson* 1850, 3109. *Bourne* 47, 3048.

Gen. Dist. Also Ceylon.

Cyanotis villosa Roem. et. Sch., *Wall. Cat.* 8995 !; *F.B.I.* vi 387, V 9. Stem '3 to 4 feet' from a procumbent base, succulent often rooting and proliferous at the nodes. Young parts villous or silky: leaf-sheaths very much so, $\frac{3}{4}$ inch, with the split hidden under long hairs. Leaves $4\frac{1}{2}$ by $\frac{3}{4}$ inch, glossy and drying dark brown above, fringed with silky hairs. Bracteoles $\frac{1}{3}$ to $\frac{5}{8}$ inch, as seen folded in the cymes nearly semi-circular. 'Filaments slender. Style swollen below the tip. Capsule oblong obtuse. Seeds conical corrugated.' Wight Ic. t. 2085.

In sholas. Pulneys: near Kodaikanal and below to Shembaganur. Nilgiris: Coonoor, Courtallum. *Fyson* 439, 2106 *Bourne* 408, 491, 525, 1024, 1239, 1239,* etc.

Gen. Dist. Also Ceylon.

Specimens from the higher Pulneys have larger leaves than those from other places, but exactly as in *Wall. Cat.* 8995.

JUNCACEÆ.

Rush.

Mostly marsh plants, with erect green often round stems and leaves, in external appearance not unlike the Sedges. Flowers in clusters, but though small and brown, complete, with six brown and hard sepals and petals (which do not fall off), six stamens with erect anthers attached at their bases to the filaments, and a superior ovary with three long stigmas on a short or long style, ripening into a small capsule which opens in three segments. Seeds anatropous, many in *Juncus*, and three only in *Luzula*.

In everything except the hard persistent sepals and petals, the flowers are very similar to those of the LILIACEÆ.

Species 200, in cold damp spots all over the world.

Seeds many in the capsule JUNCUS.
Seeds three only in the capsule LUZULA.

Juncus glaucus *Ehrh.*; *F.B.I.* vi 393, I 3; common Rush. Stems numerous, from a slender creeping rhizome, erect, round, striate, rigid, with sheaths enveloping the base. Flower-cluster $\frac{1}{2}$ to $1\frac{1}{2}$ inches, at about one-third from the top of the stem, which thins out above it to a slender point. Sepals lanceolate $\frac{1}{6}$ to $\frac{1}{8}$ inch. Stamens six. Capsule ovoid, mucronate, seeds obtuse at both ends.

The common Rush of the Kodaikanal lake. *Bourne* 1875.

Gen. Dist. North temperate climates, Himalayas from Kashmir to Nepal, south end of the Western Ghats.

Juncus prismatocarpus *Br.*; *F.B.I.* vi 395, I 12. Stems tufted, compressed, 2 to 18 inches. Leaves in two ranks; sheaths $1\frac{3}{4}$ inches; blades 1 to 3 inches, cylindrical or flattened, $\frac{1}{8}$ inch wide, soft, hollow and divided internally by partitions $\frac{1}{8}$ to $\frac{1}{4}$ inch apart (which can be felt or seen on the outside). Flower bunches at the

ends and forkings of a widely branched inflorescence. Flowers six to ten in a bunch, pale yellow. Bracts $1/12$ inch. Sepals linear acute $1/8$ inch. Stamens three much shorter. Capsule longer, seeds egg-shaped or ellipsoid much pitted. t. 269.

In wet places. Nilgiris : on the downs, Pykara, etc. Pulneys : in Kodaikanal lake, etc. *Fyson* 2518, 2565, 2887. *Bourne* 693, 697, 1693.

Gen. Dist. Plains of Bengal and Punjab, Himalayas, Khasi hills, Deccan, Ceylon, Eastern Asia generally, Australia.

LUZULA.

F.B.I. 162 II.

Herbs of marshy places with narrow grass-like leaves and clusters of small flowers, similar to JUNCUS but differing in there being only one seed to each cell of the ovary.

Species about 30, in temperate regions.

Luzula campestris DC. ; *F.B.I.* vi 401, II 3. Perennial by a short stout rhizome. Basal leaves 4 or 5 by $1/4$ inch, upper shorter and narrower. Stems 18 inches. Flower-clusters $1/4$ across in irregular umbels. Sepals $1/12$ to $1/8$ inch, ovate-lanceolate, acuminate. Capsules shorter, rounded by with the short persistent stylar point.

Pulneys : in Kodaikanal. *Bourne* 1876.

Gen. Dist. North temperate regions, western Himalayas at high elevations, Khasi hills, southern end of the Western Ghats.

ARACEÆ.

Arum, etc.

Mostly perennial herbs with radical leaves. Flowers small, unisexual or complete, with or without perianth, massed in a thick spike (*spadix*), which is enclosed at first in a large often coloured bract (*spathe*).

If flowers unisexual, then either in different spadices; or the male flowers above, the female below on the same spadix, and often sterile flowers or hairs between the two and at the top. Anthers sessile, two to four-celled. Ovary one to three-celled, with short style, discoid stigma and one or more ovules. Fruits fleshy, with usually one seed only.

Species 1,000, mainly in the tropics. In Europe, ARUM, Lords and Ladies, Friar's Cowl, etc., *Fr.* Gouet, *Ger.* Aronswurz.

Various genera are common in our gardens: e.g., ANTHURIUM and ALOCASSIA and the climbers on trees, POTHOS, PHILODENDRON, MONSTERA.

The so-called Easter-lily, *Calla æthiopica* L., or *Richardia africana* Kunth, a native of South Africa, is established in damp places near Ootacamund.

ARISÆMA.

F.B.I. 166 IV.

Cobra-flower.

Herbs with tuberous rootstock and palmately compound stalked leaves, and the top of the spadix sterile. Ovary one-celled.

Species about 50, Asia and North America.

Leaflets distinct: spadix entirely enclosed in the spathe . . .
A. leschenaultii.

Leaflet not all separate: end of spadix long and slender . . .
A. tortuosum.

Arisæma tortuosum Schott; *F.B.I.* vi 502, IV 18. Rats-tail Cobra-flower.

Stem salmon colour or green, mottled purple. Leaf-sheath very long, stalk 2 inches. Leaflets elliptic, pedately attached to each other, i.e., in twos and threes. Nerves numerous, nearly parallel and straight, joined by cross-veins, and meeting in a nerve $\frac{1}{8}$ inch from the margin, which is connected by straight veins to another nerve close to the margin. Spathe $\frac{1}{2}$ inch wide at the base, with overlapping margins: hood 2 inches wide,

finely striate, arching well over the mouth. Spadix elongate and projecting out of and above the spathe in a long rat-tail like appendage. t. 270. Wight Ic. t. 788

Nilgiris : on the borders of one area, Pykara at 6,500 feet, Kotagiri, Coonoor. Not at the higher levels. Pulneys : not seen above Shembaganur. *Fyson. Bourne.*

Gen. Dist. Mountains of India from Simla southwards.

Arisæma leschenaultii Blume ; *F.B.I.* vi 504, IV 25 ; common Cobra-flower. Very variable in size. Stem 1½ to 4 feet, pale or greenish, mottled with brownish purple markings : lower part with a few sheaths. Leaf solitary, with stalk of 4 to 12 inches, above the sheathing base. Leaflets seven to thirteen, 4 to 7 by 1 to 2 inches, elliptic-oblongate or obovate, acuminate, all equally separate : midrib strong ; nerves numerous, and meeting in a well defined nerve inside the margin. Spathe, male or female, carried on its stalk to just below the horizontally spreading leaflets : tubular below, widening out to the broad limb of about the same length, which is sharply bent over and extends horizontally covering the spadix. Spadix quite straight, erect, with flowers only on the lowest, contracted, one-third part ; above thicker, then narrowed slightly to the rounded tip. Female spadix with hair-like projections above the flowers. Fruiting mass 6 inches by 3 inches, conical, the individual berries ½ inch across green and red. t. 271.

Very common in shady cool places. Pulneys : in Kodaikanal on shaded road-sides, in woods, etc. Nilgiris : Coonoor.

Gen. Dist. Western Ghats.

ERIOCAULACEÆ

Flowers unisexual, very small and massed in a head with an involucre of bracts below. Sepals three. Petals three. Stamens three or six. Ovary of two or three cells, with one erect ovule in each.

Genera 6, species 6 to 700, in the warmer parts of the world.

The family might be described as the COMPOSITÆ of the Dicotyledons.

ERIOCAULON.

Hatpin-flower.

Herbs with all the leaves near the ground, and flower-heads on slender leafless scapes. Leaves narrow, ribbed. Flowers $\frac{1}{8}$ to $\frac{1}{20}$ inch long, each in the axil of a bract, whose grey turned-up end usually shows on the surface of the head. Sepals three, boat-shaped, or united into a spathe-like sheath which is split down in front. Petals three, on a short or long corolla tube, in all our species fringed with thick white hairs, and some at least with a prominent black mark near the top. Corolla tube in the male flower long: stamens six, with prominent anthers. Ovary in the female flower stalked above the sepals: petals springing from just below the ovary, and between the cells, oblanceolate or spatulate. Fruit three nutlets.

A very difficult genus, the flowers being minute and their differences only to be made out with the help of a good lens and much care.

A monograph has recently appeared in Engler's *Das Pflanzenreich* but as regards the Indian species is far from complete. Four new species described by me in the Kew Bulletin are illustrated here for the first time: as also I believe are the other three species.

- | | | | |
|---|---|--|----------------|
| a | { | Heads $\frac{1}{2}$ inch or more across: scape about 1 foot . . . | b |
| | | Head under $\frac{1}{2}$ inch: scape 6 inches or less | c. |
| | { | Leaves thick, smooth: heads thick | E. robustum. |
| b | { | Leaves hairy: heads flat: involucral bracts black | E. nilagirens. |
| | | Scapes 4 to 6 inches tufted: involucral bracts black; receptacle villous | d |
| c | { | Scapes solitary | e |
| | | Scapes tufted 1 to $2\frac{1}{2}$ inches: involucral bracts brown. | E. mariæ |

d	{	Leaves flat, weak : heads grey	E. collinum.
		Leaves firm, narrow, channelled above : heads white	E. christopheri.
e	{	Involucre black	E. geoffreyi.
		Involucre white	E. oliveri.

Eriocaulon robustum Steud. ; *F.B.I.* vi 572, I 4 ; White-tailed Hatpin-flower, *Chrysanthemum* scented.

Rootstock stout, as thick as the finger or thicker, sometimes creeping, densely clothed below with the dead leaves. Leaves usually 3 or 4 inches long (1 to 9), and narrowed gradually from a clasping base, 1 inch broad, to the obtuse end, lanceolate or oblanceolate, quite glabrous, finely striate with only very small and close cross nerves, firmly erect or spreading, in section boat-shaped without keel, of a fresh light green or bluish colour. Flower stems solitary, about a foot high (8 inches to 3 feet), finely ribbed and twisted; sheath rather longer than the leaves, expanded $\frac{1}{2}$ inch below the mouth, which may be split down one side $\frac{1}{2}$ inch or more. Heads $\frac{1}{2}$ to $\frac{3}{4}$ inch broad, and not quite so high; usually broadest near the top with sloping sides and so narrower at the bottom; covered when the flowers are out with the long white, downward directed, petals of the male flowers; except, often, in a band above the base, so that the head has a waist and approaches the form of a very flat hour glass; very slightly scented like *Chrysanthemum*. Involucral bracts many-seriate, ovate, acute, glabrous or with a very few short hairs, scarious, olive-black in colour. Receptacle villous, more or less hollowed at the top. Floral bracts, obovate-lanceolate-deltoid, fringed at the top with white hairs. *Male flowers*.—Sepals connected only at the base, much the same in shape as the floral bracts, with white hairs on the back. Petals connected into a distinct tube, oblanceolate, hairy, one much longer than the other two and the bract, and more

hairy, all three with a black gland on the inner face a little above the mouth of the tube. Stamens six; anthers black on slender, curved filaments. *Female flowers*:—Stalk shorter. Sepals and petals with long hairs at the base, in addition to the terminal fringe of thicker ones at the back: sepals free: petals oblanceolate, quite free, all equal in length, with black glands. Ovary of three cells, yellow: styles long connected only near the base. *t.* 272. *b* bracts; *r* receptacle in section; *s* three stamens.

On the bank of the river at Pykara. *Fyson* 2561, 2694, 2860. Coonoor (*Clarke*). Only known from the Nilgiris.

The slight enlargement of the sheath just below the mouth is not mentioned in the descriptions in *F.B.I.* and *Das Pflanzenreich*, but seems distinctly characteristic; so also is the frequent narrowing of the head above the base, by the greater length of the long petals of the male flowers in the upper and the lowest circles. The flower-head has none of the strong honey scent of *E. nilagirens*, but the faintest trace of that of the *Chrysanthemum*.

Eriocaulon nilagirens *Steud.*; *F.B.I.* vi 576 *included in E. brownianum, but not Wall. Cat.* 6066!; I 18*; Black-backed Giant Hatpin-flower, Honey scented.

Rhizome as thick as the finger, with two or three flower-stalks only. Leaves linear-oblong, acute, 6 to 12 by $\frac{1}{3}$ to $\frac{1}{2}$ inches, translucent, hairy. Peduncle about twice as long, ribbed and hairy, not much twisted: sheath 6 inches, with very long open mouth (1 to $1\frac{1}{2}$ inches), acute, translucent, with a tuft of hairs at the extreme base. Involucral bracts, oblong-ovate obtuse, black, but covered with white silky hairs and so almost grey: floral bracts oblanceolate-cuneate, hairy on the back of the triangular, not acuminate end. *Male flowers*:—Sepals black $\frac{1}{8}$ inch, oblong or elliptic, obtuse, free, but connate into a sheath split open in front, glabrous except for a fringe of white hairs at the end. Petals connate into trumpet-shaped corolla, with small, very acute lobes, ciliate only at the tips. Stamens six; anthers oblong, black.

Female flowers:—Sepals three, free, boat-shaped with decided ciliate keel, fitting by concave bases over the cells of the ovary. Petals very slender, linear except for the slightly dilated tips, fringed at the obtuse end with stout white hairs, and villous below with long silky hairs, each with a black gland. Each nutlet in fruit enclosed by the base of a sepal, the rest of which forms a slightly twisted wing. t. 273.

In damp places. Pulneys : on the Kodaikanal downs. Flowers in September. *Fyson* 1078, 2083. *Bourne* 687, 1743.* Nilgiris : *Hohenacker* 953 ! ; type is No. 950, not seen.

The use of the sepal as a wing to the nutlet has not I believe been described before. *E. bronianum* *Wall. Cat* 6066 is a Silhet plant and has smooth, smaller, light brown involucre bracts.

Eriocaulon collinum *Hook. f., Thwaites enum.* 44, *C.P.* 1000 ! ; *F.B.I.* vi 584, I 41 ; common small Grey-head. Stems tufted. Leaves $1\frac{1}{2}$ to $2\frac{1}{2}$ by $\frac{1}{8}$ inch, flat weak, obtuse. Scapes many, 3 to 8 inches, twisted when dry : sheaths $1\frac{1}{4}$ inches ; mouth oblique, not very acute. Involucre bracts all black, or the lowest and outermost in bud brown. Floral bracts numerous. *Male flowers* very small, 1.5 mm :—Sepals 1.2 mm, united into a spathe easily split into parts of different width, fringed with short white hairs. Corolla tube funnel-shaped, very slender below ; lobes unequal, one petal longer and narrower, fringed with long thick hairs. *Female flowers* :—Sepals boat-shaped, with white hairs over most of the back and keel. Petals long, lanceolate, fringed with thick hairs to the base but not hairy. Receptacle villous. t. 274.

In damp places, common. Nilgiris : on the plateau, Pykara, Kotagiri, etc. *Fyson* 5461, 1086, 2084, 2695, 2720, 2920, 2993, 2995. *Bourne* prob. 3129.

Gen. Dist. South India and Ceylon at Newera Elia.

The female petals and the long white hairs of the male are visible on the surface of the flower-head.

Eriocaulon christopheri *Fyson* ; I 45. Stems tufted : scapes several 4 to 7 inches, stout : sheaths 1 inch, with bifid mouth. Leaves 1 to 1¼ inches, firm about nine-nerved, thick and channelled above. Heads ⅛ to ⅙ inch. Lowest bracts brown, glabrous ; inner black, acuminate. Receptacle villous. Floral bracts fringed with thick white hairs. *Male flowers* :—Sepals united into a spathe split in front, fringed with thick white hairs. Corolla tube slender ; lobes unequal very long, with small glands, and fringed with long white hairs. Anthers black. *Female flowers* :—Sepal black, boat-shaped, with scattered hairs along the margin and keel. Petals white, oblanceolate, with long hairs and small glands. t. 275.

In damp ground. Nilgiri : at Pykara, flowering May. *Fyson* 2718.

Perhaps Schmidt left hand plant on sheet marked *E. trilobum* from Kaity, etc., in cover of *E. collinum* at Kew. Not known elsewhere.

The male petals are unusually long and the hair fringing them and on the female petal are also long.

Eriocaulon oliveri *Fyson* ; I 46 ; White-headed Hatpin-flower. Similar in habit to *E. geoffreyi*, but larger and the involucre bracts white : male sepals not black.

Scapes solitary, very slender, 4 to 6 inches : sheath ¾ to 1 inch, with enlarged bifid mouth. Leaves as long acute, glabrous nine-nerved. Heads ¼ inch, white. Involucre bracts white, glabrous. Floral bracts with numerous thick white hairs. Receptacle villous. *Male flowers* ⅛ inch. Sepals united into a spathe split in front ; light coloured below, darker above but not black, with white hairs upwards on the back. Corolla tube tapering downwards ; petals unequal with long fringing hairs and large glands. Anthers black. *Female flowers* as long. Sepals black. Petals with a few thick white hairs above and long white slender ones to the base. t. 276.

In damp places. Pulneys 7,500 feet. *Fyson* 2994.

Eriocaulon geoffreyi *Fyson*; I 47. Scapes solitary, very slender, 2 to 5 inches: sheath $\frac{1}{2}$ inch, with scarious bifid mouth. Leaves $\frac{1}{2}$ to $1\frac{1}{4}$ inches, flat, acute, about nine-nerved, often recurved. Heads $\frac{1}{4}$ inch, white with the hairs of the male petals. Involucral bracts black, glabrous. Receptacle glabrous. Floral bracts obovate-cuspidate, black with thick white hairs on the back and upper margin. *Male flowers*:—Sepals black, united into a spathe, split down the front. Corolla tube slender tapering downwards, enlarged above and cup-shaped; petals subequal with long thick white hairs and large black glands. Anthers black. *Female flowers*:—Sepals boat-shaped. Petals oblanceolate with fine long white hairs nearly to the base. t. 277.

On damp ground. Pulney hills. South India 7,500 feet. *Fyson* 2165, 2085.

Not known elsewhere.

The solitary scapes and stiff often recurved leaves are very characteristic.

Eriocaulon mariæ *Fyson*; I 48. Scapes several, 1 to 2 inches, slender: sheath $\frac{1}{2}$ inch: mouth single, very acute, slightly enlarged. Leaves $\frac{1}{2}$ to $\frac{3}{4}$ inch by $\frac{1}{12}$ to $\frac{1}{8}$ inch, strongly ribbed, glabrous. Heads $\frac{1}{8}$ to $\frac{1}{6}$ inch: involucral bracts light brown, glabrous. Floral bracts acute, black with tufts of white hairs. Villi of receptacle very long and copious. *Male flowers*:—Sepal $\frac{1}{25}$ inch united in a spathe split in front. Corolla tube and lobes very small, glands large. *Female flowers* $\frac{1}{16}$ inch: petals divided almost to the base into a number of fine hairs. t. 277.

Fyson 2086. Pulneys: at 7,500 feet, in a marsh on the downs above Kodaikanal.

Not known elsewhere.

The very dwarf habit, yet broad leaves, and the remarkably divided female petals make this distinct from any other,

CYPERACEÆ.

Sedge.

Sedges are distinguished from grasses by the stem being solid and usually triangular, the leaves in three not two vertical rows, with a complete sheath at the base (not split down the opposite side) and without ligule; and (though the flowering portion being made up of spikelets may appear at first sight similar) by the absence of the paleas and lodicules, and by an ordinary straight embryo in the triangular nut, the cotyledon of which does not stay inside on germination.

They are as a rule found only in marshy places, and have a perennial creeping stem (rhizome) and grass-like flowering stems and leaves, which however are devoid of starch and sugar and so useless as fodder. The flowers are exceedingly simple, and consist of an ovary with single, trifid or bifid, style, surrounded by two or three stamens, whose anthers are not versatile, but attached by their bases. There are often also three to six bristles which are regarded as representing the lost perianth. Each such flower is in the axil of a bract, called the *glume*; and the glumes are arranged in short or long *spikelets* the lowest glumes being often empty. In CAREX a complication is introduced by the presence of a casing round the ovary, and the "flowers" are unisexual. But this is referred to under the genus. The axis of the spikelet is called the *rachilla*.

The family comprises some 3,000 species, in 60 genera, and is found all over the world, mostly in damp and sour ground. Like the Grasses they are commonly gregarious, and pollinated by wind.

often three. Nut two-thirds, as long as the glume.
t. 278.

Nilgiris: on the downs Ootacamund to Pykara, flowering May. Pulneys: on the outskirts of Kodaikanal and below to 4,000 feet. *Fyson* 2922. *Bourne* 1037, 3057,* 5109.

Gen. Dist. Ceylon, Singapore, Java, South Africa, Madagascar.

PYCREUS.

F.B.I. 172 II.

Spikelets brown, much longer than broad, and broader than thick in umbels or bunches at the top of the slender stems with a few leaf-like bracts just below them. Glumes boat-shaped, in two ranks. Nuts flat (distinction from *Cyperus*).

Pycrus capillaris Nees; *var nilagiricus*; *F.B.I.* vi 59I, II 7. Stems numerous and tufted, up to 2 feet high. Leaves slender and weak, mostly from the base but also on the lower half of the stems, where the uppermost blades may be only 1 inch by $\frac{1}{6}$ inch. Spikelets clustered, $\frac{5}{8}$ by $\frac{1}{8}$ inch, much compressed, rigid, straw-coloured.

Pulneys. *Bourne* 694, 1016, etc.

Gen. Dist. Africa, south-east Asia, Australia, Deccan and Ceylon.

CYPERUS.

F.B.I. 172 IV.

Stem erect, simple, leafy only at the base. Spikelets arranged in umbels or spikes or mixtures of these, and very narrow. Glumes many, in two ranks; two at base of spikelet empty, one to three at the top male only. Axis (*rachilla*) not jointed near the base nor falling off. Stylar branches three. No bristles round the ovary.

Species 300 in all warm and temperate regions.

Cyperus digitatus Roxb., *var hookeri*; *F.B.I.* vi 618, IV 59 β . Stem tall, $1\frac{1}{2}$ to 4 feet, three-angled near the top. Leaves $\frac{1}{2}$ to $\frac{2}{3}$ inch broad, often as long as the stem. Spikelets $\frac{1}{4}$ to $\frac{1}{2}$ inch, arranged in spikes or

rays of $\frac{3}{4}$ to 2 inches, these again in stalked umbels, crowded at the top of the stem in a compound umbel of 8 to 24 inches. Bracts of umbels leaf-like, sometimes 2 feet long: stalks 1 to 8 inches. Glumes $\frac{1}{30}$ inch, boat-shaped, ultimately light brown.

Nilgiris: Pykara, etc., flowering winter months. *Fyson* 3111. Pulneys: Neutral Saddle, 5,500 feet: not Kodaikanal. *Bourne* 1253, 1421.

Gen. Dist. From the Khasi hills southwards to Ceylon.

ELÆOCHARIS.

F.B.I. 172 VII.

Stems leafless, each ending in a brown oblong spikelet of many spirally arranged glumes, characterised by the base of the style being thickened but also apparently jointed just above the nut, and by the hypogynous bristles round the ovary.

Species over 100 in all parts of the world.

Elæocharis congesta Don; *F.B.I.* vi 630, VII 15. Stems tufted 4 to 8 inches or more: sheaths crimson at the base. Spikelets $\frac{1}{4}$ to $\frac{1}{3}$ inch, subtended usually by a leafy bract; occasionally with a short branch just below. Flowers many. Ovary three-angled. Style three-fid, with swollen persistent base. Nut quite smooth. t. 279.

On the Nilgiri downs. *Fyson* 2889.

Gen. Dist. Lower hills of India and Kashmir, Nilgiris, Ceylon. Pulneys 5,000 feet.

FIMBRISTYLIS.

F.B.I. 172 VIII.

Spikelets brown of many imbricating glumes, either solitary or in compound umbels at the end of the slender scape. Leaves all from the base, not on the stem. Flowers without bristles, style enlarged at the base, and deciduous by a joint from the nut, not leaving the base on it. Outer surface of nut often with the appearance

of ribs, wrinkles or cross-hatching, on account of the large cells which compose the skin.

Species 125, in all the warmer parts of the world.

- | | | | |
|--|---|---|------------|
| a | { | Spikelets solitary | b |
| Spikelets clustered. Leaves very slender | | F. uliginosa. | |
| Spikelets stalked in irregular compound umbels | | F. paupercula. | |
| b | { | Glume with three or five slender nerves | F. kingii. |
| Glume with three nerves close together in the middle | | F. subtrabeculata. | |

Fimbristylis kingii C. B. Clarke; *F.B.I.* vi 633, VIII 8. Tufted along a short rhizome. Leaves very slender, hair-like, $1\frac{1}{2}$ to 4 inches. Stems almost as slender 4 to 10 inches. Spikelet solitary, terminal, egg-shaped $\frac{1}{6}$ to $\frac{1}{3}$ inch, by about half as much, glumes imbricate, on all sides, concave, with three to five slender nerves, glossy, chestnut-brown, the lowest empty. Stamens three. Stylar arms long. Nut about $\frac{1}{2}$ inch, white; outer cells squarish and transversely elongated.

Nilgiris: Pykara. Pulneys: below Church Cliff, Pillar Rock. Not at the highest levels. *Fyson* 2701, 2706. *Bourne* 501, 1254.

Fimbristylis subtrabeculata C. B. Clarke; *F.B.I.* vi 633, VIII 9. A larger plant than *F. kingii*, but of similar habit. Leaves 4 to 6 inches, with an abrupt point, hairy. Stems 10 to 15 inches. Spikelets $\frac{1}{4}$ to $\frac{1}{2}$ inch. Glumes imbricate all round, rich brown, with three conspicuous nerves close together down the middle of the back. Nuts two-fifth glume; outer cells transversely elongated. t. 280.

Nilgiris: Pykara. Pulneys: in the valleys near Kodaikanal. *Bourne* 1255, 1482.

Fimbristylis paupercula Boeck.; *F.B.I.* vi 647, VIII 47. Rhizome short, stems tufted 6 to 14 inches, ribbed. Leaves shorter, 2 to 10 inches, by sometimes $\frac{1}{8}$ inch, channelled above, with minute roughness along the

margins, otherwise glabrous. Spikelets in an irregular terminal compound umbel, each single umbel consisting of a central sessile spikelet and two or three others on slender stalks of $\frac{1}{6}$ inch, from the axils of $\frac{1}{8}$ inch acuminate bracts. Glumes acuminate or shortly awned, obscurely five-nerved: margins hyaline. Nut with transverse marking.

Pulneys: on the downs, on dry slopes, etc., common. *Bourne* 1260, 1469.

***Fimbristylis uliginosa* Steud. ; F.B.I. vi 648, VIII 50.** Plants tufted, clothed at the base with dead sheaths. Leaves 1 to 3 inches, very slender and hair-like; sheaths below striate. Stems 4 to 8 inches, slender. Spikelets many tufted at the top, sessile or some stalked; or reduced to one only; with one or two slender leafy bracts. Glumes aristate or mucronate, with hyaline margin. Style three-fid. t. 281.

Nilgiris: very common on the open downs. *Fyson* 2886 2926. Rendered very conspicuous in the early morning by the dew glistening on the white styles. Not known elsewhere.

***Fimbristylis cyperoides* Br. ; var *cinnamometorum* ; F.B.I. vi 650, VIII 56.** Stems tufted, on a short rhizome, very slender but thickened at the base by the sheathing bases of the leaves. Leaves several, very slender. Spikelets small, $\frac{1}{6}$ by $\frac{1}{20}$ inch irregularly umbelled in spreading panicles. Glumes few, progressively longer from the very small outer imbricate empty lowest ones to the distichous middle two to four which are fertile, and the uppermost three to six which have stamens or nothing. Style long. Nut round-trigonal, with seven to eleven ribs on each face.

Pulneys: on the downs above Kodaikanal falls, and below to Silver Cascade, and on the plains. *Bourne* 3087.

Gen. Dist. North Australia, Philippines, Caroline islands.

SCIRPUS.

F.B.I. 172 X.

Spikelets of many glumes spirally arranged, as in *FIMBRISTYLIS* and *ELÆOCHARIS*, but the base of the style not swollen nor jointed just above the way.

Species 125 in all regions.

Scirpus fluitans Linn.; *F.B.I.* vi 653, X 1. Stems weak, branched, and leafy, 2 to 12 inches long, flaccid in water or on mud. Leaves $\frac{1}{2}$ to $2\frac{1}{2}$ inches, very narrow. Spikelets solitary, terminal on the stem and its branches, $\frac{1}{8}$ by $\frac{1}{16}$ inch. Glumes boat-shaped, the lower not much shorter than the upper, more or less imbricate or distichous; lowest empty, the others all fertile, without bristles. Style continuous with the top of the ovary. Nut one-half to two-thirds the glume.

Pulneys: on the downs, Pillar Rocks shola, etc. *Bourne* 1219, 3019.

Gen. Dist. Nilgiris, Ceylon, Khasia, and nearly all regions.

Scirpus articulatus Linn.; *F.B.I.* vi 656, X 9. Giant Rush. Stems many, 12 to 30 inches, the thickness of quill to a lead pencil, hollow with cross partitions inside, surrounded by a sheath at the base. Spikelets in a dense bunch on one side about half way up, $\frac{1}{2}$ to $\frac{1}{3}$ inch long, rusty or dark purple. Glumes slightly keeled, entire. Style slender, 'branches three, long.' Nuts a symmetrical pyramid with slightly concave face. t. 282.

Nilgiris: Pykara, flowering May. *Fyson*.

Gen. Dist. Throughout India, also Africa, Philippines, Australia.

Scirpus mucronatus Linn.; *F.B.I.* vi 657, X 11. A robust water-sedge, with triangular green stems 2 or 3 feet high, having a dense bunch of spikelets on one side an inch or so below the top. Roots fibrous. Stem enclosed below in a triangular sheath. Membranous on one side

of the blunt top. Spikelets ovoid, $\frac{1}{3}$ inch : glumes many closely imbricate, ovate sub-acute, many-ribbed. Bristles five or six unequal, retrorsely scabrous ; the two longest nearly as long as the nut. Style three-fid. Nut obovoid, trigonous, black, smooth, shining, half as long as the glume.

Pulneys : in the lake at Kodaikanal. *Bourne* 636.

Gen. Dist. Throughout India, Europe, Madagascar, the warmer parts of Asia, and Australia.

Scirpus sub-capitatus *Thw.* ; *F.B.I.* vi 661, X 20. Stems many from a short woody rhizome, round, sheathed at the base and for about two inches ; quite bare above for about twelve inches, and then bearing a close tuft of many spikelets from the axils of shorter, acuminate bracts. Spikelets, $\frac{1}{3}$ to $\frac{1}{2}$ inch, many-flowered, brown. Glumes except the lowest in two ranks, entire. Bristles long, slender, slightly thickened at the tips.

Pulneys : near Kodaikanal by Bear shola, Berberis shola and the Kodaikanal waterfall. *Bourne* 1220, 1460.

Gen. Dist. Deccan peninsula, Nilgiris, Ceylon, and eastwards to Sumatra and China. Not northwards in the Bombay Presidency.

LIPOCARPHA.

F.B.I. 172 XIII.

Stem leafy at the base only, and bearing high up a bunch of one to ten egg-shaped spikelets with subtending bracts : distinguished from the closely allied SCIRPUS by each flower having two very thin elliptic scales (formed by coalescence of bristles).

Species 13 in warm climates.

Lipocarpa argentea *Br.* ; *F.B.I.* vi 667, XIII 1. Rhizome short, vertical. Leaves 4 to 6 by $\frac{1}{6}$ inch. Stem 4 to 18 by $\frac{1}{8}$ inch, three-cornered. Spikelets egg-shaped, six to ten in a close terminal bunch with two or three long tapering bracts of differing lengths

($\frac{1}{2}$ to 3 inches) immediately below. Glumes imbricate on all sides, finally deciduous from the persistent rachilla. Scales with two marginal and two central strong nerves. Nut egg-shaped.

Nilgiris: Pykara, etc. Flowering May. Pulneys: Silver Cascade 5,500 feet, not above. *Fyson* 2924. *Bourne* 1015, etc.

Gen. Dist. All over the tropics and sub-tropics of the Old World.

RHYNCOSPORA.

F.B.I. 172 XIV.

Spikelets with the lowest three glumes empty, one or more nut-bearing glumes in the middle, and one or two male or sterile, thinner and unkeeled, imbricate glumes at the top. Style with a swollen base which remains on the nut, but is distinguishable from it.

Species 150 in the warmer regions of the world, especially America.

Rhyncospora wightiana Steud. ; *F.B.I.* vi 669, XIV 2. Stems tufted, 10 to 14 (4 to 24) inches, leafy. Leaves several $\frac{1}{10}$ inch wide, acute, glabrous. Spikelets several in small heads, stalked in the axils of the upper leaves. Glumes distinctly keeled. Nut $\frac{1}{10}$ inch, light brown, transversely ribbed, capped by the papery persistent style which extends a little down the sides. Bristles as long as the nut, with minute hairs pointing upwards (to see these requires a compound microscope).

Nilgiris: in swamps on the downs near Ootacamund. Pulneys: near Kodaikanal. *Bourne* 1459, 1490, 5209.

Gen. Dist. South India, Cochin China.

CAREX.

F.B.I. XXVIII.

In this genus the stamens are borne in the axil of a bract, in every way similar to the glume of *Cyperus* or any of the other genera, but the ovary is surrounded by a bottle-like covering called the utricle.

The morphology of this utricle and of the bract outside it has been much debated, but since the former has two nerves it has been agreed generally that it is formed by the union of two glumes, and that the bract is therefore not a glume but the bract of a spikelet which is reduced to only one flower. The ultimate unit, what one might call the 'flower' is therefore in the case of the female unit, a spikelet. These spikelets are usually borne in spikes, which again may be in simple spikes or in panicles. The male 'flower' is regarded by some as a flower quite like that of other Cyperaceæ but by others as a reduced spikelet like the female, but still more reduced for there is no utricle, no trace therefore of the glumes. What appears therefore to be spikelet is on this view really a spike of one-flowered spikelets, and what appear to be the glumes of the spikelet are in reality the bracts subtending the spikelets on the spike.

This is the view taken in Engler and Prantl's *Pflanzenfamilien*, and in the *F.B.I.* by C.B. Clarke. In the *Genera Plantarum* the more general view was adopted that the male unit is a flower, and therefore the spike really a spikelet as it looks to be; but the female unit a reduced spikelet as now supposed and the apparent spikelet a spike.

Since for the purposes of a FLORA it is of more importance that there should be no mistake on the part of the reader as to what part is being described, than that the correct morphology of the part be indicated, I shall in the following call the ultimate units, "flowers" and drop the word spikelet. My "flowers" then are, in the case of the female, the utricle and its contents with the bract outside, and in the case of the male the stamens and their bract.

- | | | | |
|---|---|---|-----------------------|
| a | { | Stem leafy at the flowering part | b |
| | { | Spikes dense, interrupted, no leaves near them | |
| | | | <i>C. muricata.</i> |
| | { | Leaves $\frac{1}{8}$ inch wide or less : spike $\frac{3}{4}$ inch, dense ; bracts ovate | <i>C. nubigena.</i> |
| b | { | Leaves $\frac{1}{4}$ inch wide : spike slender 1 to 2 inches ; bracts narrow | <i>C. longipes.</i> |
| | { | Leaves $\frac{1}{4}$ inch wide : spikes several, dense ; bracts lanceolate, awned | <i>C. lindleyana.</i> |

Carex nubigena *D. Don*; *F.B.I.* vi 702, XXVIII 6; Spiky Carex. A rush-like plant with narrow grass-like leaves, and slender green stems ending in one or two slender pointed leaves and an irregular compact or interrupted spike of 'flowers,' which when young shows anthers at the top, but later on appears only as a number of pointed, divergent utricles.

Stems tufted, leafy only at the base and the tip, and clothed below with short colourless leaves. Leaf-sheath

short, scarious at the top and with almost a ligule, like a grass: blade slender, incurved or folded and so appearing less than $\frac{1}{16}$ inch wide; terminal ones slenderer and shorter, with no sheath but a scarious sheathing base. Spikes of 'flowers' in a more or less compact compound spike; the end flowers male only, the lower ones female. Anthers two, crested. Bract of the female flowers with a conspicuous double green midrib produced as a short or long bristle. Utricle strongly veined along the edges, but without veins on the flat faces. t. 283.

In fairly damp places, but not actually in water, often with *Hydrocotyle asiatica*.

Nilgiris: Ootacamund to Pykara, 6,400 feet, flowering May. *Fyson* 2925. Pulneys: below Kodaikanal near Vilpatti; Kukal. *Bourne* 1211, 1435.

Gen. Dist. Himalayas, Khasia, Sind, Western Ghats, Ceylon to Malay, China and Japan.

Carex muricata Linn., var *foliosa*; *F.B.I.* vi 703, XXVIII 7 ♂. Similar to *C. nubigena* but leaves flat. Compound spike 1 to 2 inches interrupted. Bracts usually under $1\frac{1}{2}$ inches. Anthers crested. Utricle smooth.

Pulneys: below the church at Kodaikanal; Poombari; Kukal. *Bourne* 1342, 1411, etc.: not on the downs. Nilgiris: *Wight*, probably at lower levels only.

Carex longipes D. Don, var *dissitiflora* C. B. Clarke; *F.B.I.* vi 705, XXVIII 11 γ. Rhizome short. Leaves nearly flat, the lowest 10 to 18 by $\frac{1}{6}$ to $\frac{1}{4}$ inch, upper smaller: many-ribbed. Stems 6 to 20 inches, leafy. Spikes $1\frac{1}{2}$ to 2 inches, hardly stalked in the axils of the stem-leaves. Bracts about $\frac{1}{8}$ inch apart, $\frac{1}{3}$ inch long, finely acuminate, with green many-nerved middle part and hyaline margins. Utricle with its beak $\frac{1}{4}$ inch, sessile in the axil of each bract, many-ribbed.

Pulneys: Gundan shola, Gundattu shola, etc., near Kodaikanal. *Bourne* 1210, 1465, 3101, 3104.

Carex lindleyana Nees; *F.B.I.* vi 721, XXVIII 63. Rhizome long, woolly, creeping, sheathed by the fibrous remains of the leaf-bases. Leaves flat, $\frac{1}{6}$ inch, finely acute, the lowest 10 to 12 inches: upper, on the stems, shorter. Stems 1 to $2\frac{1}{2}$ feet slender. 'Flowers' in dense spikes or spike-like panicles in the axils of the upper (short) leaves. Utricle $\frac{1}{6}$ inch, oblong ellipsoid, many-nerved, with linear deeply bifid beak, its bract often scabrid on the keel and short awn; as also are the stalks of the spikes. Styler branches three.

Pulneys: by the Kodaikanal lake. *Bourne* 3103. Nilgiris, 6 to 8,000 feet. *Wight* 'frequent.'

* *var major*; a robust plant with larger spikes but otherwise apparently the same, near *Berberis shola*, Kodaikanal. *Bourne* 1461.

GRAMINEÆ.

Grass, Bamboo.

Annual or perennial herbs with round hollow stems and swollen nodes, at which they are often bent abruptly and root near the ground; often tufted at the base but not usually branching much above ground. Leaves in two opposite rows, clasping the stem by a lower split sheath, and with a narrow free blade, which has many parallel nerves, and at the junction between sheath and blade a small flap of thin tissue, often reduced to mere hairs, termed the *ligule*. Flowers small and consisting only of three stamens with long anthers lightly attached by the middle to slender filaments, a one-celled ovary with two feathery styles, and in addition two small white bodies, of obscure origin, termed lodicules: these all enclosed between a firm, more or less boat-shaped and ribbed *glume* below, and a thin papery two-nerved *palea*, above. One or more such flowers, arranged close above each other in two opposite rows,

with a pair of empty glumes (without paleas) at the base and possibly a sterile one at the top, forming a *spikelet*. These spikelets arranged in open panicles, bunches spikes, or pairs (one of a pair stalked, the other sessile); such spikes or pairs being again arranged in various ways. Fruit a *grain* (one seed enclosed in and inseparable from the wall of the ovary), usually enclosed between the now hardened glume and its paleas. Endosperm mealy.

A very large family with about 310 genera and 3,500 species, found in all parts of the world, and often covering large areas. Economically it is perhaps the most valuable to man of all families, the leaves forming the staple food of cattle and horses, the grains of man.

From the CYPERACEÆ the round stem, two ranked leaves and split sheath easily distinguish this family.

The glumes are referred to by their position as numbered in order from the base of the spikelet. Thus glumes i and ii are the two sterile glumes; gl. i being always on the outer side of the spikelet, gl. ii on the inner side, next the axis which bears it. (Glumes iii, iv, v, etc., are the flowering glumes, iii being vertically above i, iv above ii, v above iii and so on. One or more of the glumes may have as a prolongation of its tip, or attached to the back, a slender spine (*awn*), which is often bent and by its hygroscopic twistings buries the grain (enclosed in the glume) in the soil or the coat of some passing animal (cf. Herons-bill, p. 53). The stalk of the spikelet itself, on which the glumes are set is called the *rachilla*.

ANALYSIS OF THE GENERA.

- | | | |
|-----|---|--|
| a { | { | Spikelets jointed to their stalks, so that the two lowest glumes come away with the grain (never more than one). Flowers one or two, but if two the top one alone fertile. |
| | | See also j, CALAMAGROSTIS. A. PANICACEÆ, b |
| | | Spikelets not jointed to their stalks, so that the two lowest glumes remain attached to it, while the rachilla breaks between the glumes above. Flowers one, two or more. |
| | | See also e, ISACHNE. B. POACEÆ, h |

A. PANICACEÆ.

- | | | |
|-----|---|---|
| b { | { | Glume iii in fruit equal to i and ii in hardness, though often much larger. (PANICEÆ) c |
| | | Glume iii, and iv if it occurs, hyaline, so that the spikelet may appear to have only two glumes and one or more paleas. Spikelets always in sets of two, unequally stalked, or at the top of the spike a set of three. . . . (ANDROPOGONEÆ). g |

- c { Spikelets one-flowered ; glumes three only, awnless, the
outer two equal, and enclosing the rest.
p. 446. PASPALUM.
- d { Spikelets of one or two flowers, the upper one male. . . d
Glumes without awns. e
Glumes awned f
- e { Glume i shorter than the others. . . p. 449. PANICUM.
Glume i equal to ii or nearly so, spikelet not jointed to its
pedicel below glume i but above ii. . p. 447. ISACHNE.
Spikelets in bunches of three to five ; glume i long awned.
p. 450. OPLISMENUS.
- f { Spikelets in spikes or open panicles ; glume iv awned,
glume i not p. 450. ARUNDINELLA.
Both spikelets of a pair with ovary. . p. 453. POLLINIA.
Both spikelets two-flowered, stalked spikelet male.
p. 454. ISCHÆMUM.
- g { Spikelets one-flowered, sessile one with ovary, stalked one
male. Inflorescence various. p. 451. ANDROPOGON, ETC.
Spikes bunched in the axils of large bracts.
p. 459. ANTHISTIRIA.

B. POACEÆ.

- h { Spikelets producing one grain only : leaves narrow. . . i
Spikelets with more than one fertile flower. j
- i { Spikelets one-flowered, slender, awned, in open panicles,
not jointed to their stalks. . p. 456. CALAMAGROSTIS.
Spikelets two-flowered, awnless ; a swamp grass.
p. 457. CÆLACHNE.
- j { Spikelets awned. k
Spikelets not awned m
- k { Awns three : spikelets in close spikes. p. 458. TRIPOGON.
Awn single, fixed half way down the glumes. p. 457. AVENA.
Awn single, fixed at the end of the glume l
Spikelets in panicles . glumes round-backed, many-nerved.
p. 462. BROMUS.
- l { Spikelets sessile, in spikes. . . p. 462. BRACHYPODIUM.
Flowers eight or more : glumes strongly three-nerved. . . .
p. 459. ERAGROSTIS.
- m { Flowers few : glumes five to seven nerved. . p. 461. POA.
Spikelet triangular with broad base. . . . p. 464. BRIZA.

PASPALUM.

F.B.I. 173 I.

Spikelets one-flowered, flattened against the axis of the spike, jointed to their pedicels. Two outer, empty,

glumes equal in length and completely enclosing the rest ; inner flowering glume and palea alike thin, papery, but ultimately becoming hard. Grain ovoid, enclosed in the hardened glume and palea.

Species 160, in the tropics of both hemispheres, but chiefly in America, where in the temperate parts they form an important part of the Rampos grass.

Paspalum perrottetii *Hook. f.* ; *F.B.I.* vii 20, I 15. Stem creeping below, very variable in height, 6 to 24 inches much branched below. Leaves 2 to 6 inches by $\frac{1}{4}$ to $\frac{1}{3}$ inch, glabrous or hairy. Sheaths $1\frac{1}{2}$ to 2 inches. Ligule $\frac{1}{8}$ inch, scarious. Panicle 2 to 4 inches, of four or five whorls of slender spikes. Spikelets in pairs with unequal stalks so as to be distributed evenly along the spike: glume i $1\frac{1}{12}$ inch, seven or nine-nerved ; gl. ii nearly as long seven to nine-nerved ; gl. iii nerveless smooth.

Nilgiris : in the Botanic gardens at Ootacamund. Pulneys : at 5,500 feet. Not collected above. *Bourne* 1277, 1278, 2306, 2305, etc.

Gen. Dist. Also Ceylon, North Africa.

ISACHNE.

F.B.I. 173 III.

Perennial grasses. Spikelets globular or elliptic, two-flowered and differing from all the other Panicaceæ in not being jointed to the pedicel below the lowest glumes, but above the first pair as in the Poaceæ. Two first glumes nearly equal. Two flowering glumes, thin but hardening in fruit and with the hardened paleas enclosing the hemispherical grain.

About 20 species, widely distributed in the warmer parts of the world, more especially Asia, Africa, and across to Australia and Japan ; rare in America.

Glumes i and ii longest : spikelets hairy . . . *I. kunthiana.*

Glume iii longer than iv ; glumes i and ii shorter : glabrous . . .

I. australis.

Glume i much shorter than ii and iii. Leaves $\frac{1}{2}$ inch broad.

I. gardneri.

Isachne kunthiana *Wight and Arnott* ; *F.B.I.* vii 21, III 1. Similar in habit to *I. australis*, but leaf-blades smaller, $1\frac{1}{2}$ to 2 inches only. Spikelets $\frac{1}{8}$ to $\frac{1}{6}$ inch : outer glumes acuminate, longer than glume iii, and with very few hairs on the marginal ribs.

Pulneys : Bearshola valley, near Kodaikanal, Silver Cascade, Poombari, etc. *Bourne* 1481, 1041, 1280.

Gen. Dist. Nilgiri and Travancore hills 6,000 to 8,000 feet Ceylon, Singapore, Java, Borneo.

Isachne australis *Br.* ; *F.B.I.* vii 24, III 12. Whole plant hairy, stems ascending, rooting often at the lower nodes. Leaf-blades lanceolate, $2\frac{1}{2}$ by $\frac{3}{8}$ inch, softly hairy on both sides, with numerous obscure nerves and hardly distinguishable midrib : ligular hairs $\frac{1}{8}$ inch ; sheath also ciliate. Panicle about 3 by 2 inches ; pedicels $\frac{1}{30}$ to $\frac{1}{10}$ inch (the spikelets often in pairs unequally stalked), hardly thickened at the top. Spikelets globose, purplish $\frac{1}{10}$ inch. Glumes all approximately equal ; i and ii obscurely many-ribbed, with a few white hairs towards the upper half ; iii nearly glabrous and nerveless, concave with stamens only ; iv similar, but more pubescent on the back, with stamens and ovary ; paleas in both nerveless, not cross-ribbed, nearly opaque.

In moist ground. Nilgiris. Pykara. Flowering May, after rains. *Fyson* 2927 [glume i hairy]. Pulneys : by the lake at Kodaikanal, Silver Cascade, etc. *Bourne* 1276, 1281, 1282. (Glume i glabrous.)

Gen. Dist. India from Assam to Ceylon and Burma, and on to Australia and New Zealand.

Isachne gardneri *Benth.* ; *F.B.I.* vii 26, III 16. Stem 2 to 3 feet. Leaf-blades 3 to 5 inches by $\frac{1}{2}$ to $\frac{3}{4}$ inch near the base, lanceolate acuminate. Panicle 4 to 6 inches high and wide : its branches very slender, not much divided. Spikelet $\frac{1}{6}$ inch, on stalks (branches of panicle)

of $\frac{1}{4}$ to $1\frac{1}{4}$ inches. Glume i three-nerved: gl. ii longer, five-nerved: gl. iii smooth.

Pulneys: in sholas on the downs near and above Kodaikanal. *Bourne* 1283, 1893, 2490.

Gen. Dist. South Indian hills at 6,000 feet, etc., Ceylon.

PANICUM.

F.B.I. 173 IV.

Spikelets two-flowered, the upper flower alone seeding. Glume i very small: gl. ii and iii nearly equal, many-nerved: gl. iv glabrous, shorter than the others, and with the palea enclosing the grain as a hard skin.

A large genus of about 300 species, common in all the warmer parts of the world, but rare in Europe and north temperate America.

Panicum indicum Linn., var *gracile*; *F.B.I.* vii 41, IV 23. Spikelets lanceolate acute, two-flowered, crowded into a dense cat's-tail-like spike, 3 inches by $\frac{1}{3}$ inch. Glume i very much shorter than the others, many-ribbed: gl. ii seven to nine-nerved: gl. iii three-nerved: palea of gl. iii minute, with stamens only: gl. iv glabrous, shiny, much smaller, and tightly fitting round the grain as it ripens.

Pulneys near Kodaikanal in river beds. *Bourne* 1286, 1904.

Gen. Dist. (of species). Sub-tropical and tropical India from Gharwhal eastwards and southwards, Ceylon, tropical Asia and Africa.

OPLISMENUS.

F.B.I. 173 XI.

Weak stemmed grasses with thin flat leaves and one-flowered spikelets in twos and threes along simple or compound spikes and remarkable for the long awn attached to glume i.

Species perhaps only 4 but as many as 30 described in tropical and sub-tropical zones.

Oplismenus undulatifolius Beauv.; *F.B.I.* vii 66, XI 1. Stem 1 to $1\frac{1}{2}$ feet, slender. Leaf-blades $1\frac{1}{4}$ to 2

by $\frac{1}{4}$ to $\frac{1}{3}$ inch, lanceolate acute; sheath $\frac{1}{2}$ to $\frac{3}{4}$ inch: ligule a ridge of hairs. Spike simple, terminal, 2 to 5 inches. Spikelets three or four together. Glume i three-nerved, its awn $\frac{1}{4}$ to $\frac{2}{3}$ inch, firm, not subulate: gl. ii five-nerved, its awn much shorter: gl. iii seven-nerved, also awned.

Pulneys: by the lake side at Kodaikanal. *Bourne* 1912. Nilgiris.

Gen. Dist. Warmer regions generally.

ARUNDINELLA.

F.B.I. 173 XII.

Erect grasses with narrow leaves, and panicles of one or two-flowered spikelets, which are not jointed to their stalks, but in the middle below the fertile glume iv. Glume i three or five-nerved; gl. ii slightly longer, five-nerved; gl. iii empty or with stamens only, thin, five or seven-nerved; gl. iv with stamens and ovary, smaller than the others, awned or not, usually bearded at the base. Grain free within it.

Species about 24, in the tropics of the Old World, few in America.

- | | | | |
|---|---|---|----------------|
| a | { | Glume iv with two short awns and a longer middle one | b |
| | | Glume iv with one awn only | c |
| b | { | Branches of panicle with spikelets to the base | A. mesophylla. |
| | | Branches naked near the base: perennial grass. | A. setosa. |
| c | { | Leaves $\frac{1}{3}$ to $\frac{1}{6}$ inch wide | A. villosa. |
| | | Leaves $\frac{1}{4}$ inch wide. Spikelets along one side of the branch, often in pair | A. fuscata. |

Arundinella mesophylla Nees ex Steud., *Herb. Wight. Prop.* 2347!; *F.B.I.* vii 69, XII 3. Annual. Stem 1 to 2 feet, hirsute or pubescent. Leaves $1\frac{1}{2}$ to 4 by $\frac{1}{6}$ to $\frac{1}{4}$ inch, hirsute narrowed to the base: ligule obscure. Panicle spiciform, purple, hairy, its branches $\frac{3}{4}$ inch,

erect, flowering to the base. Glume i ovate, hirsute, three-nerved, hardly awned: gl. ii rather longer, five to seven-nerved, narrowed into a beak: gl. iii obtuse: gl. iv lanceolate, pilose at the base, with a medium awn as long again as the spikelet, and two much shorter lateral ones.

On the downs of both plateaus. *Fyson* 3112. *Bourne* 1029, 1029,* 3003. Courtallum.

***Arundinella setosa* Trin.; F.B.I. vii 70, XII 5.** Root-stock hard, perennial. Stems densely tufted, 2 to 3 feet, leafy. Leaf-blades 3 to 5 by $\frac{1}{4}$ inch, not flat; sheaths 2 to 3 inches: ligular hairs $\frac{1}{8}$ inch. Panicle 2 to 6 inches, the spikes (branches) $1\frac{1}{2}$ to 2 inches, bare at the base. Glume i about $\frac{1}{6}$ inch acuminate, three-nerved: gl. ii five-nerved, also acuminate; gl. iii much shorter obtuse, five to seven-nerved; gl. iv $\frac{1}{2}$ to $\frac{2}{3}$ of iii with two short straight awns, and a central long bent one, with the upper part, beyond the bend, as long as gl. i.

Pulneys: near Kodaikanal and below. *Bourne* 1447, 1915. Nilgiris: Ootacamund.

Gen. Dist. Higher hills of India and Ceylon.

***Arundinella villosa* Arn. ex Steud., Hcrb. Wight Prop. 2037, var *heyne*, Wall. Cat. 8663 A; F.B.I. vii 72, XII 11.** A coarse grass, hairy all over. Stem 12 to 16 inches, very leafy at the base. Leaves 6 to 12 by $\frac{1}{6}$ to $\frac{1}{3}$ inch, villous; but basal sheaths glabrous. Panicle 4 by $\frac{1}{2}$ inch, soft; in fruit $1\frac{1}{2}$ inches wide. Glume i hirsute with hairs from bulbous bases along the margin and the four nerves; gl. ii similar and longer; gl. iii glabrous, five-nerved; gl. iv hirsute at the base, notched at the insertion of the awn; awn twisted, longer than but not twice as long as the flower. t. 284.

Pulneys: (Wight Kew Dist. 1871). Nilgiris: on the downs.

Gen. Dist. Central India, Khasi hills, east Himalayas, South India, Ceylon.

The species was founded on a Ceylon plant.

Arundinella fuscata Nees; *F.B.I.* vii 74, XII 14. Perennial. Stem 1 to 2 feet, stiff, quite glabrous. Leaves mostly near the base; blades 2 to 5 by $\frac{1}{4}$ to $\frac{1}{2}$ inch, flat, hairy, tapering from base to tip. Panicle $2\frac{1}{2}$ to 5 inches, dense, its branches (spikes) stiff, erect, 1 to $1\frac{1}{2}$ inches. Spikelets crowded along one side only of the spike, often in pairs of which one has a longer stalk than the other. Glume i aristate three-nerved; gl. ii five-nerved; gl. iii obtuse as long as i; gl. iv with slender awn, $\frac{1}{8}$ inch long beyond its bend.

Nilgiris: on the downs near Ootacamund. Pulneys: on the downs above Kodaikanal and down to Silver Cascade. *Bourne* 1019, 1428, 3006, 5241.

Gen. Dist. Western Ghats and Pegu.

POLLINIA.

F.B.I. 173 XXXIV.

Spikelets in pairs, one stalked, the other sessile, in spikes which radiate out from the top of the stem; both kinds one-flowered, or the sessile one two-flowered. Glume i thin, but hard, with thickened edge. Glume ii three-nerved, often thinner, boat-shaped. Glume iii very thin and papery with a minute palea at its base. Glume iv reduced to a small thin papery enlargement of the base of the awn. Stamens three. Ovary oblong with two distinct styles and feathery stigmas. Grain included in the outer glumes.

Species about 30, in the tropics of Asia, Africa and Australia.

The third glume is so thin that it may well be mistaken for a palea, and the palea that belongs to it is difficult to make out because closely appressed to it and very small. See figure.

Lowest leaves brown-tomentose at the base. *P. phæothrix*.
Stem, etc., glabrous at the base *P. quadrinervis*.

Pollinia quadrinervis Hack, *var wightii*; *F.B.I.* vii 110, XXXIV 3. A strong growing grass, with stem $1\frac{1}{2}$ to 3 feet and leaves 15 inches by $\frac{1}{3}$ inch and radiating,

spikes of 3 to 5 inches. Stem glabrous. Leaf-blades hirsute with hairs from bulbous bases: ligular hairs $\frac{1}{8}$ inch: sheath 3 to 6 inches. Spikes softly hairy on rachis, stalks of spikelets, and margins of the outer glumes. Spikelets $\frac{1}{5}$ to $\frac{1}{4}$ inch, oblong-lanceolate, subacute. Glume i concave or grooved down the back, with four obscure nerves visible from the inside, glossy and glabrous except for the long white hairs on the lateral pair of nerves where it is folded in like a palea: gl. ii smooth, ciliate on the margins: gl. iii hairy above: gl. iv with awn of $\frac{3}{4}$ inch, bent and twisted.

Pulneys: on the slopes above Bearshola. *Bourne* 522, 1927.

Gen. Dist. Sub-tropical Himalayas, Pegu, China.

Pollinia phæothrix Hack; *F.B.I.* vii 112, XXXIV 9; Auburn tresses. Stems $1\frac{1}{2}$ to 2 feet, clothed at the base with rust-coloured tomentose sheaths. Leaf-blades slender, 6 to 18 inches, acuminate, hairy on the back. Spikes, 2 to 4 inches golden brown in colour, softly hairy, with hairs along the rachis, stalks of spikelets and backs of glume i. Spikelets $\frac{1}{4}$ to $\frac{1}{5}$ inch. Glume i densely clothed with hairs on the marginal nerves; gl. ii nearly glabrous but for hairs above the middle; gl. iii nerveless, ciliate on the obtuse tip; gl. iv shorter, with awn inserted in the cleft. *t.* 285.

On the open downs, round Ootacamund and Kodaikanal, a beautiful grass, flowering September. *Fyson* 3113. *Bourne* 1406, 2107, 5215, etc.

Gen. Dist. Also Ceylon and Tonkin.

ISCHÆMUM.

F.B.I. 173 XXXVII.

Annual or perennial grasses with rather broad leaves. Spikelets in pairs, one stalked, the other sessile, two-flowered, in dense spikes radiating from the top of the

stem. Sessile spikelet with one fertile flower, the top one, and a staminate flower: stalked spikelet with two staminate flowers, neither as a rule having an ovary.

Species about 34 chiefly tropical monsoon regions, rare in Africa and America.

***Ischæmum ciliare* Retz. ; F.B.I. vii 133, XXXVII 16 ;** the Purple Grass of the hills.

Leaves coarse, lower sheaths much compressed; blade 2 by $\frac{1}{3}$ inch, elliptic acute, softly hairy all over; ligule $\frac{1}{10}$ inch high, triangular: nodes ciliate. Flowering stem slender, purplish upwards. Spikes two, diverging; one stalked $\frac{1}{6}$ inch beyond the other, purple except for the white hairs on the outer glumes. Sessile spikelet: glume i obovate, $\frac{1}{6}$ inch, notched with two strong ribs, winged upwards and clothed with white hairs from the base; gl. ii boat-shaped, very stiff, keeled and crested at the top; gl. iii thin, reddish, not ribbed, with stamens and a tiny pistillode, palea thin obscurely two-ribbed; gl. iv enclosing a perfect flower, bifid, ciliate, with a long $\frac{1}{2}$ -inch awn attached about half way. Stalked spikelet: gl. i strongly one-nerved, not bifid or winged, hairy on the back; gl. ii three-nerved at the top, and with scarious margins; gl. iii two-nerved enclosing stamens only; gl. iv deeply cleft, ciliate, awned, enclosing a perfect flower.

The two spikelets are similar except as regards gl. i. In the sessile spikelet it has a round back and two winged ribs; in the stalked spikelet it has a single crested keel.

On the open downs of both plateaus. *Fyson* 2516. *Bourne* 1085,* 1401, 1539, 5238, etc.

Gen. Dist. From Nepal and Bengal southwards to Ceylon and on to Malaya, China and Australia.

F.B.I. 173 LIII.

A large genus of 200 or more species, chiefly in tropics. Divided into several subgenera some at least of which may be considered as genera.

Andropogon pertusus Willd.; *F.B.I.* vii 173, LIII 18.
Very similar to *A. foulkesii* Hook. f. (below) but nodes
bearded.

Gen. Dist. From the Punjab southwards to Burma and Ceylon.

Andropogon foulkesii Hook. f., *Foulkes* "on Kaity Brow!"; *F.B.I.* vii 174, LIII 19. Stem 8 to 18 inches, very slender glabrous: rootstock perennial. Leaves 3 to 10 inches by $\frac{1}{6}$ to $\frac{1}{2}$ inch, finely acuminate, hispid with spreading hairs; midrib strong: mouth of sheath and ligule villous with long hairs. Spikes 1 to 2 inches, on slender stalks of $\frac{1}{4}$ to $\frac{1}{2}$ inch; axils bearded with long soft hairs. Spikelets purple. Glume i with about nine obscure or evident nerves; gl. ii three-nerved, keel scabrid towards the top, margin ciliate; gl. iii hyaline, without nerves; gl. iv of sessile spikelet with awn of $\frac{1}{2}$ to $\frac{3}{4}$ inch. Stalk of pedicelled spikelet with long hairs: glumes i and ii much as in the sessile. t. 286.

Nilgiris: on the downs near and below Ootacamund—Pykara, Kaity, etc. Pulneys: near Kodaikanal and down to 5,500 feet at Periyashola. *Fyson* 2889.* *Bourne* 1031, 1031,* 1470 1509, 5222, etc.

Not reported from elsewhere.

CHRYSOPOGON.

See p. 455.

Chrysopogon wightianus *Nees* (*Andropogon wightianus Steud.*); *F.B.I.* vii 191, LIII 48. Remarkable for the red or purple glumes and long bent awns.

Stems tufted 2 to 3 feet, from a short rootstock, leafy. Leaf-blades 3 to 10 inches, glabrous or pubescent, with a few scattered long hairs on the margin near the base: ligule very short, villous. Panicle 8 by 7 inches; branches whorled, very slender, $\frac{1}{2}$ to 1 inch, each with one set only of three spikelets, or bifurcating and bearing two sets, pubescent at the base and forking, and clothed with erect red hairs under the spikelets, or also on the stalks of the stalked spikelet. Sessile spikelet $\frac{1}{4}$ inch pale yellow: glume i round backed, obscurely two-nerved, glabrous up to above the middle, then hairy, surrounded at the top by a hyaline wing; gl. ii keeled and with slender $\frac{1}{2}$ inch awn; gl. ii with stout awn 2 inches long, bent at the middle. Stalked spikelets $\frac{1}{2}$ inch, red; gl. i seven-nerved, purple between; gl. ii three-nerved, green with purple patch, margin ciliate; gl. iii two-nerved, retrorsely ciliate; gl. iv hyaline, nerveless.

Pulneys: in and near Kodaikanal and on the downs by woods. Nilgiris: Neduwattum; and down to the plains at Madras. *Bourne* 1008, 2034, 3122, etc.

Chrysopogon zeylanicus *Th.* (*Andropogon zeylanicus Nees.*); *F.B.I.* vii 192, LIII 50. Rootstock stout, whole plant pubescent. Leaves 10 to 15 inches, narrow pubescent, and margin ciliate: sheaths 3 to 4 inches, the

lower flattened and keeled. Panicle 6 by 3 to 4 inches. Branches very slender, nearly glabrous, green and bluish, villous with rusty brown hairs under the spikelet. One awn only to the set. Sessile spikelet: glume i round-backed, scabrid near the tip, two-nerved, minutely two-toothed; gl. ii one-nerved, awnless, mucronate; gl. iii purplish; gl. iv with slender awn $1\frac{1}{4}$ inches. Pedicelled spikelet: gl. i seven-nerved, three lateral nerves very near the edge and close together; gl. ii hyaline, three-nerved; gl. iii purplish down the middle with two obscure nerves; gl. iv small, hyaline nerveless; stigma dark purple.

Pulneys: round Kodaikanal and on the downs. *Bourne* 1009, 1209.

HETEROPOGON.

See p. 455.

Heteropogon contortus *Beauv.* (*Andropogon contortus* *Linn.*); *F.B.I.* vii 199, LIII 63. Stem about 1 foot, densely tufted. Leaf-blades $1\frac{1}{2}$ to 3 inches, rather rigid, mouth of sheath with long hairs: no membranous ligule. Spike 1 to 2 inches of eight to eleven pairs of flowers, and a terminal solitary sessile spikelet. Sheath of pedicelled spikelet very short. Spikelets, $\frac{1}{3}$ inch: glume i many-nerved with hair on swollen base. Glume iv of sessile spikelet with hirsute awn 2 inches long.

Pulneys: Kodaikanal, on the downs, by Fairy falls, etc. *Bourne* 1207,* 2025, etc.

CYMBOPOGON.

See p. 455

Coarse strongly scented grasses with spikes (of paired spikelets) paired in the axils of sheathing bracts. Spikes, (of a pair) similar, or one stalked, the other sessile. In each spike the lowest pair of spikelets similar, male or neuter: of the other pairs, the sessile (male) spikelet flattened back and front, glume iv with awn.

- a { Stem 1 to 2 feet : spikes two only, terminal. . . . C. lividus.
 { Stem 3 to 4 feet : pairs of spikes panicked b
 b { Glume i of sessile spikelet deeply grooved at the base. . . .
 { Glume i not deeply grooved. C. confertiflorus.

Cymbopogon polyneuros Stapf (Andropogon polyneuros Steudel), Hohenacker 933 ! ; *F.B.I.* as Andropogon schænanthus var versicolor Hack., vii 205, LIII 71 ; Wild Rusa oil or Geranium grass.

A coarse tufted strongly scented grass variegated green and purplish. Stem 3 to 4 feet. Leaves with rounded base. Panicle 6 inches ; sheath 1 inch, coloured green and blackish, with the characters given above. Spikes $\frac{3}{4}$ by $\frac{1}{6}$ inch, at length divergent. Spikelets $\frac{1}{5}$ inch, rachilla and stalks very hairy. Male spikelet : stalk bearded and expanded above into a thin oblique membranous cup ; glume i with nine strong, broad nerves, and with a deep indentation in the lower half ; gl. ii. one-nerved, ciliate ; gl. iii hyaline with ciliate margin. Female spikelet : gl. ii with a narrow wing attached at the back.

Nilgiris : Ootacamund, Pykara, etc. *Fyson* 2709.

Cymbopogon confertiflorus Stapf (A. nilagiricus Hochst.) ; *F.B.I.* as A. nardus var nilagiricus, vii 206, LIII 72 ; Wild Citronella grass.

Stem 3 to 4 feet. Leaves 2 to 4 by $\frac{1}{4}$ to $\frac{2}{3}$ inch, glaucous beneath : ligule firm. Panicle 10 to 12 inches. Spathes (subtending pairs of spikes) $\frac{1}{2}$ inch, acuminate. Glume i of sessile spikelet flat or with a shallow, not deep, groove in the lower half. Awn of glume iv $\frac{1}{3}$ inch, slender.

Pulneys : in and round Kodaikanal. *Bourne* 1346, 1347. Nilgiris : at lower levels.

Cymbopogon lividus Stapf (Andropogon lividus Thwaites) ; *F.B.I.* vii 209, LIII 77 ; Purple grass.

Stem $1\frac{1}{2}$ to 2 feet, tufted, smooth, slender but rigid. Leaf-blades 2 to 5 inches, acuminate, stiffly erect, many-nerved, nearly glabrous: ligule $\frac{1}{8}$ inch. Spikes (of paired spikelets) two, one with stalk of $\frac{1}{6}$ inch, the pair subtended by a $\frac{1}{2}$ -inch acuminate bract. Rachis and stalk of spikelets hairy. Lowest pair of spikelets awnless and infertile. Of the other pairs: sessile spikelet $\frac{3}{8}$ inch; glume i obscurely two-toothed and two-nerved, with a very narrow scabrid wing hollowed at the base where the edges are incurved; gl. ii one-nerved, ciliate, mucronate or shortly awned; gl. iv, with slender awn. Pedicelled spikelet: gl. i many-nerved, glabrous; gl. ii three-nerved, ciliate, shorter; gl. iii hyaline.

Nilgiris and Pulneys on the open downs, from July to September. *Bourne* 1256, 1946, 3127, 5240, etc.

ANTHISTIRIA.

F.B.I. 173 LIV.

Tall grasses with narrow leaves. Spikelets one-flowered, in spikes or bunches of six to eleven, each bunch with a large empty spathe-like bract at the base, then a ring of four male spikelets without awns, and above them a set consisting of a sessile female awned spikelet and a stalked male one; or sometimes with two such sets, except that the upper has two male spikelets. The spikes or bunches are again bunched in the axils of large spathes.

Species few in the warmer parts of the Old World.

Easily distinguished from all our other genera by the compound bunches of spikelets.

Anthistiria ciliata Linn.; F.B.I. vii 213, LIV 4. A tall annual grass, very variable in size, often scrambling up bushes. Leaf-blades 4 to 15 inches, ciliate near the base with hairs on bulbous bases. Outer spathes 1 to 3 inches; bracts of spikes clothed with tuberculate bristles.

Spike or bunch of spikelets $\frac{1}{2}$ inch. Awn of female spikelet stout, $1\frac{1}{4}$ inches.

On the downs near Ootacamund and above Kodaikanal. *Bourne* 1950, 5239, etc.

Gen. Dist. North-west India ascending to 7,500 feet. Bengal, Malabar, etc.

CALAMAGROSTIS. F.B.I. 173 LXXIV.

Narrow-leaved grasses (of the POACEÆ see p. 446), with narrow or spreading panicles of one-flowered spikelets, which are not jointed to their pedicels, but the rachilla jointed at the base, and not produced beyond gl. iii, which is awned.

Closely allied to AGROSTIS and DEVEUXIA, and the exact number of species indeterminate.

Calamagrostis pilosula *Hook. f.*; *F.B.I.* vii 263, LXXIV 10. A very slender grass with stems of 1 to 2 feet and open panicles of small spikelets. Leaves narrow, usually very narrow, smooth: ligule largest on the upper leaves. Glume i smooth, round-backed; gl. ii similar but slightly shorter; gl. iii hairy all over with sub-basal awn.

In wet situations on both plateaus. *Bourne* 1486, 1962, 5234, etc.

Gen. Dist. Temperate and Alpine Himalayas from Kashmir to Sikkim, Nilgiris, Ceylon.

CÆLACHNE. F.B.I. 173 LXXVIII.

A genus of one species only.

Cælachne pulchella *Br.*; *F.B.I.* vii 270, LXXVIII 1. A small swamp grass peculiar in having leaves at equal distances (of about 1 inch) all the way up the stem, and in the spikelets being few, under ten, in a short spike which may be over-topped by the last two leaves.

Stem 4 to 8 inches, very slender. Leaves $\frac{3}{8}$ inch, on sheaths of $\frac{1}{2}$ inch. Spike $\frac{1}{4}$ to $\frac{3}{4}$ inch. Spikelets $\frac{1}{16}$ inch: glumes i and ii $\frac{1}{40}$ inch, concave, obtuse, persistent; gl. iii about twice as long, and palea equal to it, glabrous; gl. iv very small, intermediate in size between i and iii, hyaline very hairy, its palea similar to it.

Pulneys: in upper swamps. *Bourne* 1313.*

Gen. Dist. Tropical Asia, Australia, Madagascar.

AVENA.

F.B.I. 173 LXXXII.

Oat-grass.

Annual or perennial grasses with flat leaves and two or more flowered. Spikelets of the POACEÆ (p. 446), i.e., not jointed to their pedicels but jointed above the two basal, sterile, glumes, and sometimes between the flowering glumes. Glumes i and ii thin, persistent, nerved. Flowering glumes, three to seven-nerved, two-toothed or cleft at the top, with a long bent awn fixed at the back below the cleft.

Species chiefly in north temperate regions.

Avena aspera *Munro*; F.B.I. vii 277, LXXXII 5. Rough Oat-grass. Stem 2 to 5 feet, slender, smooth, purplish, ending in a narrow panicle of erect spikelets. Leaves 6 to 12 inches; sheath smooth; ligule short. Spikelets with three or more flowers: glume i $\frac{1}{3}$ inch, acute; gl. ii slightly longer and with longer point; gl. iii and following five to seven-nerved, scabrid, cleft about a third of the way down, the lobes acute but not awned, with a long bent and twisted awn arising below the cleft. Rachilla hairy between the glumes.

Pulneys: near Kodaikanal. *Bourne* 1036, 1966, 1967, etc.

Gen. Dist. Khasi, Nilgiri and Pulney hills, Ceylon.

TRIPOGON. F.B.I. 173 LXXXVII.

Slender densely tufted grasses with rolled leaves and many-flowered spikelets (of the POACEÆ p. 446) arranged in two rows and forming a very slender one-sided terminal spike. Basal glumes somewhat separated, one-nerved. Flowering glumes with two or four teeth, a strong awn fixed below the central cleft, and sometimes short awns terminating the lateral teeth. Styles short.

Species 10, in tropical and sub-tropical Asia and Africa.

Tripogon bromoides *Roth.* ; *F.B.I.* vii 287, LXXXVII 8. Stem 6 to 12 inches, slender, smooth. Leaves 2 to 5 inches, rolled, mostly densely tufted at the base of the stem; upper stem-leaves few, about 1 inch on sheaths of 2 inches. Spikelets slender, about $\frac{1}{2}$ inch, sessile in a simple terminal spike spreading outwards, olive-green in colour: glume i $\frac{1}{20}$ inch, close against the stem in a furrow in it, deeply notched on one side, membranous with stout nerve; gl. ii $\frac{1}{8}$ inch, mucronate; flowering glumes four-lobed, with a strong central awn attached to the back below the middle cleft, and two short awns terminating the outer pair of lobes and continuous with the two lateral nerves. Palea about three-quarters as long as the glume finely jagged at the rounded end. Rachilla bearded at the base of each flower (easily seen at the flowering time because the glumes open widely).

On the downs of both plateaus. *Fyson* 2769. *Bourne* 1973, 2100, 2110, 3149,* 5223, etc.

Gen. Dist. Western Ghats and Ceylon. Not northward into Bombay.

ERAGROSTIS. F.B.I. 173 CIV.

Annual or perennial grasses with erect stems and narrow leaves. Spikelets many-flowered, not jointed at

the base, nor between the glumes, and rachilla not produced beyond the top glume. Basal, empty, glumes much smaller than the spikelet, equal or unequal. Flowering glumes three-nerved, deciduous from the rachilla: paleas two-nerved, persistent on the rachilla or deciduous. Grain minute, free in the glume and palea.

Species about 100 in warm countries.

Eragrostis amabilis *Wight and Arnott; Herb. Wight Prop.* 1777!; *F.B.I.* vii 317, CIV 8. Stem rooting at the lower nodes, 6 to 18 inches, slender. Leaves quite glabrous (mouth of sheath occasionally with one or two hairs, and a very small ligule): blade 2 to 3 inches, strongly ribbed, acute, inclined to become rolled. Flowering stem 5 to 6 inches above the last leaf, purplish. Spikelets $\frac{1}{4}$ to $\frac{1}{2}$ and by $\frac{1}{8}$ to $\frac{1}{6}$ inch, purplish stalked in bunches, whorls, or on short, $\frac{1}{2}$ inch, spikes, at irregular intervals along the main axis of the panicle: glumes $\frac{1}{16}$ to $\frac{1}{12}$ inch, with purple tips and green nerves, the lateral nerves straight and strong. Palea as long as its glume, scabrid along the two nerves. Grain ellipsoid $\frac{1}{30}$ to $\frac{1}{50}$ inch.

Nilgiris: Pykara, flowering May. *Fyson* 2890. *Bourne* 1038, 2387.

Gen. Dist. All over India from Kashmir to Burma and Ceylon.

Eragrostis tenuifolia *Hochst.; F.B.I.* vii 322, CIV 19. Stems tufted, 1 to 2 feet. Leaves up to 6 inches long in large specimens, with a few hairs only, outside, at the junction of blade and stalk. Panicle 3 to 6 inches by $1\frac{1}{2}$ to 2 inches, its branches ramifying near the base. Spikelets $\frac{1}{5}$ to $\frac{1}{4}$ inch, by half as broad, with about nine flowers (seven to thirteen): glume i minute ($\frac{1}{50}$ inch) nerveless; gl. ii half as long again, one-nerved; flowering glumes $\frac{1}{10}$ to $\frac{1}{12}$ inch. Grain $\frac{1}{12}$ inch, slightly compressed, grooved on the dorsal side,

Nilgiris : at Ootacamund, common. Pulneys : in and below Kodaikanal down to 5,000 feet, etc. *Bourne* 1037, 1044, etc.

Gen. Dist. Mountains of South India, tropical Africa.

Eragrostis nigra *Nees*, ex *Steud.*; *F.B.I.* vii 324, CIV 22. Stem about 18 inches (1 to 36), very leafy at the base. Leaves about 6 inches, bearded at the top of the sheath. Panicle 6 to 18 inches; its branches numerous very slender. Spikelets $\frac{1}{16}$ inch: glumes i and ii about $\frac{1}{12}$ inch, one-nerved; flowering glumes slightly shorter. Grain $\frac{1}{32}$ inch or smaller, on the dorsal side slightly grooved.

Nilgiris : Ootacamund. Pulneys : near Kodaikanal and down to 5,000 feet. *Bourne* 1039, 1512, 4820, etc.

Gen. Dist. Temperate and tropical India from Simla to Sikkim, Khasi hills, Deccan peninsula and Ceylon.

BRIZA.

F.B.I. 173 CXVII.

Quake-grass.

Distinguished by the broad, tapering or triangular spikelets on very slender pedicels, in open panicles, and by the broad, nearly round, keel-less, glumes, and broad paleas.

Species about 10 in temperate regions.

Briza media *Linn.*; *F.B.I.* vii 336, CXVII 1; common Quake-grass. Stem about 15 inches, very slender. Leaves 3 inches, flat. Panicle pyramidal 3 inches wide, with hair-like horizontal branches. Spikelets $\frac{1}{5}$ by $\frac{1}{6}$ inch with horizontal base.

Nilgiris : on the downs introduced. *Bourne* 5235.

Gen. Dist. Europe, north Asia and temperate mountains of India and Thibet.

POA. F.B.I. 173 CXVIII.

Annual or perennial grasses with flat or rolled leaves, and panicles of two to six-flowered spikelets, breaking up between the flowers. Flowering glumes five to seven-nerved, slightly longer than their paleas.

Species 100, in temperate and cold countries. Britain has 8 (common Meadows and Lawn grasses).

Poa annua Linn.; F.B.I. vii 345, CXVIII 17. Stem 6 to 12 inches, shortly creeping and rooting at the lower nodes, then bent at nodes and erect, slightly compressed, smooth: internodes gradually lengthening upwards. Leaves 2 to 4 by $\frac{1}{12}$ to $\frac{1}{8}$ inch, smooth. Panicle up to $3\frac{1}{4}$ inches. Spikelets $\frac{1}{6}$ to $\frac{1}{5}$ inch. Grain $\frac{1}{25}$ to $\frac{1}{12}$ inch.

An introduced weed, native of Europe and temperate Asia. Also Himalayas and Khasi hills. Bourne 1911, 3161.

BROMUS. F.B.I. 173 CXXII.

Annual or perennial grasses with narrow flat leaves and open panicles of long narrow spikelets, with round-backed, five to nine-nerved, awned, flowering glumes. Rachilla jointed between the flower-glumes, and not produced beyond the uppermost. Glumes i and ii persistent, unequal. Grain adherent to the palea. Uppermost flowers often imperfect.

Species 45, in temperate regions and on tropical mountains.

Bromus asper Murray; F.B.I. vii 358, CXXII 2. Stem slender 2 to 3 feet. Leaves very slender, 12 to 18 by $\frac{1}{8}$ to $\frac{1}{2}$ inch. Spikelets about $\frac{1}{2}$ inch: glume i $\frac{1}{6}$ inch; gl. ii longer; flowering glumes $\frac{1}{3}$ to $\frac{1}{2}$ inch, round-backed at the base, scabrid towards the top, with awn about as long.

Pulneys: in moist places, near and below Kodaikanal. *Bourne* 1035,* 1992, 1994, etc.

Gen. Dist. Temperate mountains of India, Europe, North Africa, North Asia.

BRACHYPODIUM. F.B.I. 173 CXXIV.

Perennial slender grasses with flat or rolled leaves and long slender spikes of narrow many-flowered, awned, spikelets, sessile on and closely appressed to the axis.

Species 6 in temperate regions and on tropical mountains.

Brachypodium sylvaticum Beauv.; *F.B.I.* vii 362, CXXIV 1. Stem 2 to 4 feet very slender. Leaves narrow, acuminate, more or less hairy. Spike 2 to 6 inches, nodding, its axis flattened. Spikelets $\frac{3}{4}$ to 1 inch by $\frac{1}{6}$ inch, green. Glume i $\frac{1}{8}$ inch strongly nerved; glume ii longer; flowering glume about $\frac{1}{2}$ inch, seven-nerved, gradually narrowed into the slender erect awn of $\frac{1}{3}$ to $\frac{1}{2}$ inch.

On the downs of both plateaus. *Bourne*.

Gen. Dist. Europe, North Asia, temperate mountains of India, South Africa.

APPENDIX.

Addendum to

ROSACEÆ.

PRINSEPIA.

F.B.I. 151 VI.

One species only.

Prinsepia utilis Royle; *F.B.I.* ii 323, VI 1. A spiny shrub: branches green, round and smooth. Leaves shortly stalked, 2 by $\frac{1}{2}$ inch, elliptic acute, entire or finely serrate except towards the base, glabrous. Flowers in the axils of the upper leaves, or of bracts forming racemes along the upper branchlets, on rather stout $\frac{1}{2}$ to 1 inch pedicels, which may have two or three minute scales. Buds top-shaped, purplish brown in the lower half. Sepals $\frac{1}{6}$ inch, concave, round. Petals $\frac{1}{3}$ inch, round with crinkled edge, white. Stamens numerous with yellow anthers, from a conspicuous disc. Ovary superior, one-celled; ovules two, attached to one side, pendulous: style basal, bent below the large flat stigma. Fruit roughly oblong, rounded at each end, with the persistent style attached near the base. Seed one only, erect with thick cotyledons. t. 95.

Nilgiris: on the Coonoor-Kotagiri road at 7,000 feet, flowering June, apparently wild! (and if so now first recorded). Used sometimes as a hedge plant.

Gen. Dist. Dry rocky hills of temperate Himalayas to Sikkim at 9,000 feet and Khasi hills at 6,000 feet.

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